AN HBJ PUBLICATION

AUGUST 1985/$2.00

WEEDS TREES & TURF

The Magazine of Landscape and Golf Course Management Since 1962

Updated 1985 Fertilizer Guide

New Series on Team Management in Business

Nutrients and Soil Tissue Testing

Warm Season Turf Renovation

BEARD COLLECTION

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AUGUST, 1985 VOLUME 24, NUMBER 8

WEEDS TREES & TURF

The Magazine of Landscape and Golf Course Management Since 1962

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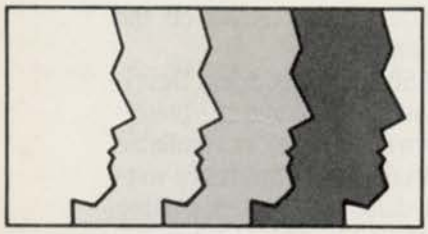
26 Nutrient Needs of Turf

Dr. Ray Freeborg and William Daniel of Purdue University list how to determine soil nutrient deficiencies.



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The first installment in a three-part series on team management addresses hiring and retention of personnel. Parts II and III will appear in the September and October issues, respectively.

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Cover photo by Ron Hall, assistant editor.

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JOHN DEERE

Nothing Runs Like a Deere®

by the Editorial Staff, *Weeds Trees & Turf magazine*

Cutting down on toxic waste

Toxic waste can be reduced significantly, say Blattelle Memorial Institute scientists, by modifying manufacturing and handling processes. A group of four scientists studying waste generation recently reported that with certain changes, "Waste can be reduced, recycled and reused, or eliminated in attractive and cost-effective means. The group concentrated on manufacturing processes.

Meanwhile, the Environmental Protection Agency is concentrating on the most commonly used pesticides for detoxification of rinsates. EPA is exploring mandatory recycling of pesticide containers. Reusable bulk containers are being tried by some larger distributors and users of landscape pesticides. See Government Update in this issue.

Drought spotlights wetting agents

Drought conditions impacted an unusually large portion of the U.S. this spring and summer causing a resurgence in interest in wetting agents.

Mallinckrodt's Bill Rhymes blames soil conditions and hard water for inefficient water use in U.S. landscapes and golf courses. "When a soil or other growing medium wets slowly or nonuniformly, it is due to the physical properties of the soil as well as the water. Hydrophobic organic components of soil and a preponderance of capillary pore space combine to restrict the rate of water movement into such soils. Water's high surface tension, due to strong cohesive forces, restricts movement into capillary pore space. These same characteristics delay water movement out of the soil causing localized wet spots."

The solution to both dry and wet spots, Rhymes claims, is to increase the rate of water movement by providing a link between hydrophobic soil and hydrophilic water. He claims the link is a wetting agent.

Rhymes offers these guidelines for buying wetting agents. 1) Don't buy water. Check the percent active ingredient. 2) Select one with a history of success, ranked consistently high in university tests. 3) Wetting agents must be well watered in (liquid) or uniformly mixed with the soil (granular). Wetting agent left on the plant surface can be phytotoxic.

Rhymes says wetting agents also improve drainage, reduce runoff, and eliminate dew for several days following application.

U.S. firms arrange European ties

Uncertainty over currency exchange rates is causing U.S. corporations to establish direct links with European companies. Du Pont recently agreed to acquire Amonn Fitochimica of Italy to direct market agrichemicals in key European markets. Jacobsen Manufacturing recently signed a direct marketing agreement with a British distributor to eliminate one step of distribution. The net result will be a more international market for U.S. and European products and better prices.

WT&T

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HOW TO AVOID SLEEPLESS NIGHTS DURING PYTHIUM WEATHER.

SUBDUE

Circle No. 274 on Reader Inquiry Card

Seed shortages likely; prices could go up

The pendulum swings both ways. That's what seed producers in the Pacific Northwest are finding out this year as over-production of past years has caught up with the industry and shortages are predicted.

"Two years ago, we were crying in our beer about over-production of Kentucky bluegrass," says Bob Peterson of E.F. Burlingham and Sons, Forest Grove, OR. "Now, the acreage is down, so I would anticipate a tight situation this year."

Kent Wiley of Pickseed West, Tangent, OR, says that his company is virtually sold out of all its proprietaries. "The worst disaster is in Kentucky bluegrasses," Wiley notes. "Last winter, the ground froze before greenup, and the grass stayed in a burn state. Production is off about two-thirds in the Peluce area south of Spokane. We're figuring all the bluegrasses together will go down from 40 to 30 million pounds."

Adds Mike Robinson of Seed Research, Albany, OR, "Most of the bluegrasses are sold out. And I think the bentgrasses will be very tight for another year, especially since Emerald is out of production now.

"There's also a short supply of perennial ryegrass because the demand is way up. Old crops have been completely sold out in some varieties."

Bill Rose of Turf Seed, *Hubbard OR, explains some of the research being conducted by Pure Seed Testing during the company's third annual field day earlier this summer. Nearly 300 people turned out for the event.*

Even though Doyle Jacklin of Jacklin Seed, Post Falls, ID, is expecting a good crop of proprietary bluegrasses, he sees prices going up.

"This hot, dry weather has affected common Kentucky bluegrass," Jacklin says. "Since all our accounts are keyed on the availability of common varieties, proprietaries will also go up in most cases—even though we have a pretty fair crop of proprietary Kentucky bluegrass looking at us."

(Editor's note: WEEDS TREES & TURF will publish its annual Seed Harvest Report in the October issue.)

WATER

Summer rains welcome to Fla. Green Industry

The mid-June arrival of rain was met with open arms by nurserymen, landscapers, golf course superintendents—just about everyone involved with turf or plantlife along Florida's gulf coast. The beginning of the rains hopefully gives relief from an extended drought and the severe water use restrictions it spawned.

The Florida drought, which began in August 1984, affected more than 3 million people in the 16 counties of the Southwest Florida Water Management District. SFWMD spokesman Bob Bryant cautions, however, "we're not out of the woods yet. What we need is an entire summer of significant rainfall."

Bryant says his district's ground water supply was 15 to 20 inches below normal prior to the coming of rain. "The evaporation and transpiration losses were phenomenal," he tells **WEEDS TREES & TURF**. Record high temperatures late this spring aggravated the problem.

Although some irrigation was allowed for newly installed sod and landscaping, the watering of established residential lawns was restricted to early mornings just twice weekly. Violators faced fines of $500.

Florida Green Industry spokesmen tell **WT&T** the drought "hurt business." Says John Blaser, operator of Blaser's Landscape Contractors, Tallevast, FL, "When people can't plant and water, they won't buy plants."

Marvin Gross of Marvin's Garden & Landscape Service, Sarasota, says "the Green Industry just about stopped because of the drought and the restrictions."

Elsewhere, the driest March-May period in 96 years of record keeping took the Tennessee Valley into summer with a 10 inch rainfall deficit.

"There has been no curtailment in use of water so far," says a spokesman for the TVA, "but it could cause us some problems late in the summer."

TREES

Budworms plague trees in Colorado

The Denver Post reports budworms are killing thousands of trees across Colorado in what foresters are calling one of the most severe and prolonged infestations of the century.

The budworms which kill Douglas firs and some spruces by feasting on their needles, infest three million acres and have killed more than 60 percent of the trees in some remote areas of the Front Range, according to the U.S. Forest Service.

Because of monetary considerations, the Forest Service is letting the infestation "run its course." Some unhealthy trees have been removed.

Budworms appear in droves about once a decade. But only twice this century have foresters recorded a budworm infestation lasting longer than five years. The current attack has proved especially troubling because it began in 1974 and doesn't appear to be abating, says the Forest Service.

Foresters believe most of the affected trees will survive.

TURFGRASS

Turfgrass tops billion dollar mark in VA

Almost a half million acres of home lawns help boost Virginia's turfgrass industry over the billion dollar mark, says Dr. Jack Hall, reporting on a recently released survey. Hall is extension agronomist for turf at Virginia Polytechnic Institute.

The survey, initiated in 1982 by the state and federal agriculture departments, indicates 1.1 million home lawns (a 27 percent gain in lawn area since the last survey in 1972) and 826,000 acres of turfgrass in the state. Turfgrass now ranks as the third largest crop acreage in Virginia. The dollar amount of the turfgrass industry doubled in the last decade, claims Hall.

The survey also points out there are 246 golf courses in the state and the cost of maintaining turf, establishing new areas, and purchasing equipment exceeds $32 million annually, more than triple the total in 1972. Paid labor costs are believed to be responsible for much of that increase.

FERTILIZER

Moderate growth seen for controlled release

A California-based research and consulting firm says the non-agricultural demand for controlled release fertilizers will grow at a maximum rate of 3.5 percent annually until 1988.

That modest prediction is offset somewhat by a higher growth rate (4.5 to 7 percent) in certain segments such as nurseries, sod farms, landscapers, and forestry, says SRI International, Menlo Park, CA.

In 1983, nonagricultural markets such as home lawns and gardens, golf courses and other professional turf, nurseries and landscaping accounted for about 93 percent of the total U.S. demand for manufactured controlled release products and for 87 percent of processed natural organic fertilizer materials—sewage sludge, leather tankage, and dried manure.

SRI says controlled release products accounted for 11 percent of the total volume of fertilizer used in nonfarm markets in 1983, processed natural organic materials 16 percent.

For further information contact Thomas C. Gunn, Director, Chemical Economics Handbook Program, SRI, 333 Ravenswood Ave., Menlo Park, CA 94025.

TREES

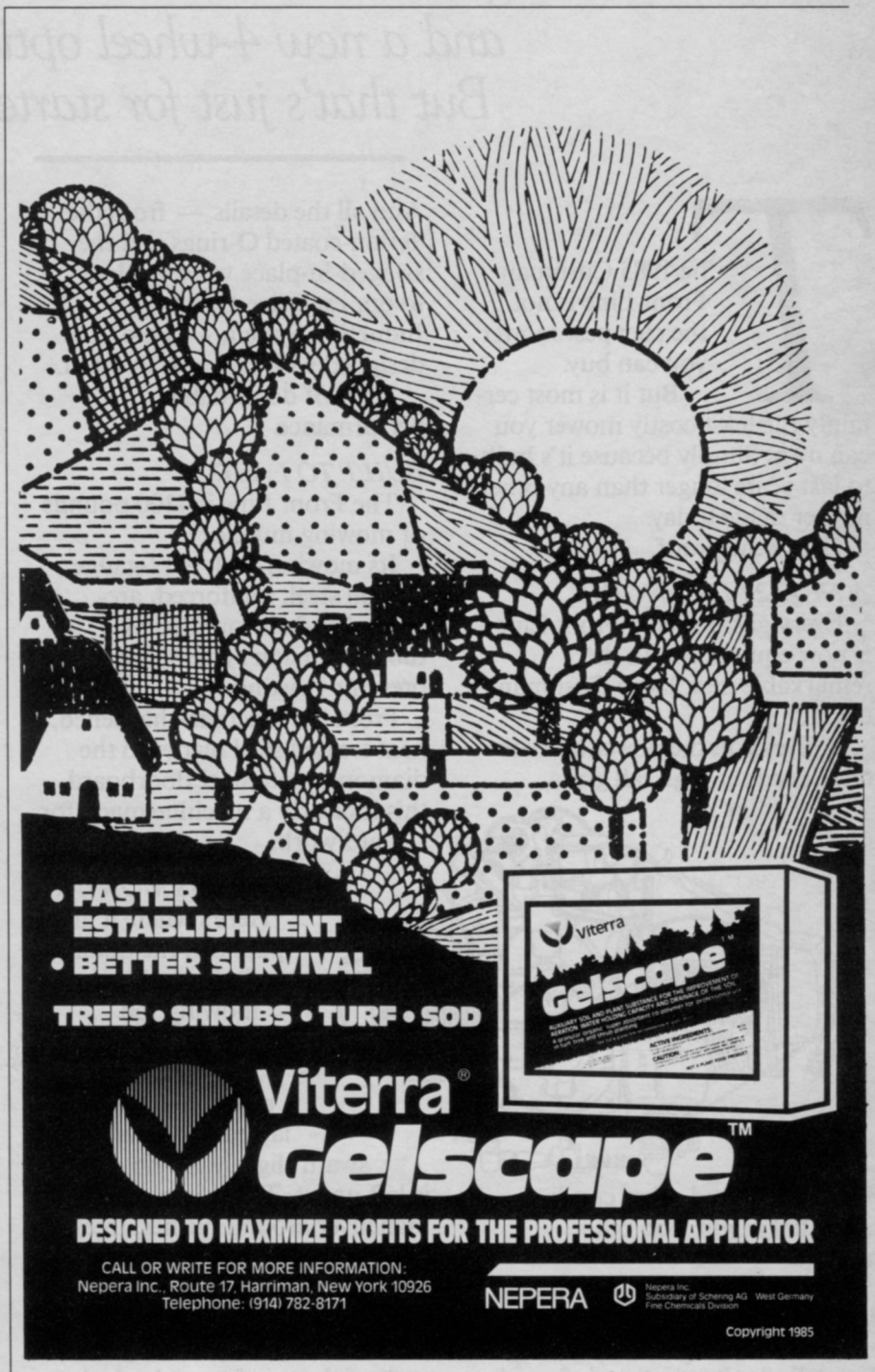
Environmental Care starts tree division

Environmental Care of Calabasas, CA, has created a new Tree Care Division devoted solely to the care of trees on commercial sites.

The new division, Arbor Care, will serve commercial and industrial centers, public facilities, military bases and similar landscape properties in the Los Angeles and Orange County areas of California. Services will be available on a one-time or contract basis.

Bruce K. Wilson, president of Environmental Care, Inc., said a firm's investment in trees can be substantial and proper maintenance is essential.

"Our more than 35 years experience in landscape maintenance and tree growing provides us with special expertise in this important area."



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But it is most certainly the least costly mower you can **own.** Simply because it's built to last years longer than any other mower made today.

Here's the proof.

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Every gas-powered Front Line is now equipped with the remarkable new 22-hp Cushman engine.*

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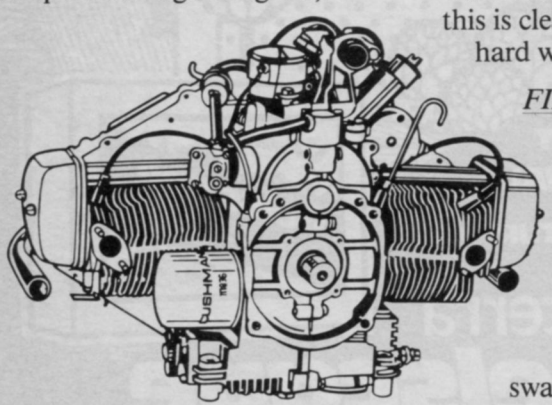

dense weeds and other conditions that might stop other mowers.

It's built the way you want an engine built — tough. The crankshaft is forged alloy-steel. The cylinder heads are reinforced for extra strength under stress.

And all the details — from the Teflon-coated O-rings and the swaged-in-place valve guides, to our exclusive Clean-Air Induction System — were designed with one goal in mind.

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The Front Line is 1300 pounds of mowing muscle.

Its mowing deck is 12-gauge carbon steel; reinforced, arc-welded and surrounded by a tubular torsion system that prevents twisting.

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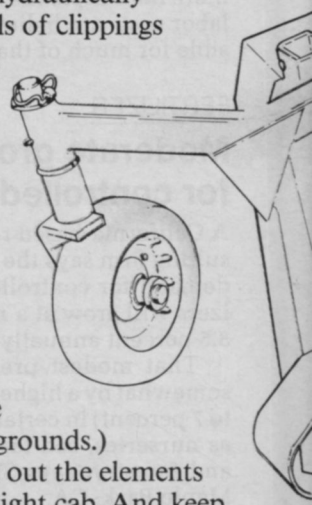

You can choose our original 3-wheel design, or Cushman's new 4-wheel model (a big plus on delicate turf or steeper grounds.)

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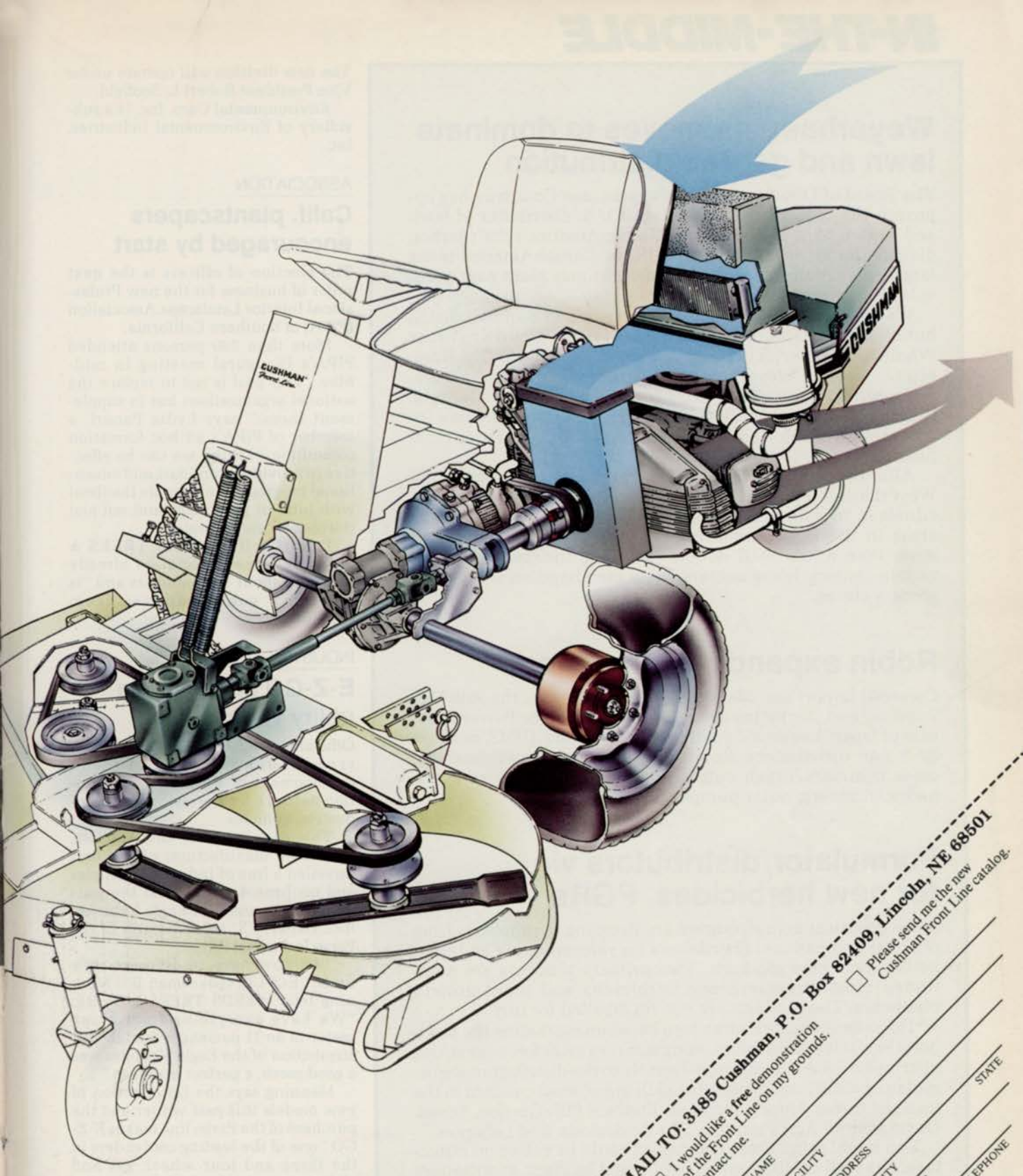

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IN-THE-MIDDLE

Weyerhaeuser moves to dominate lawn and garden distribution

The Board of Directors of the Weyerhauser Company has approved the acquisition of the largest U.S. distributor of lawn and garden hard-line products, GardenAmerica's distribution division for an estimated $125 million. GardenAmerica is the largest distributor of Ortho brand consumer plant care products in the country.

Weyerhauser will add GardenAmerica's 15 Sun Belt distribution sites to its Nursery Products Division which owns Hines Wholesale Nurseries in California and Texas and Wight Nurseries in Georgia. Weyerhauser is a joint owner of Shemin Nurseries with locations in Connecticut, Maryland, Georgia, Illinois, Michigan and Florida. The deal includes Shemex International of Holland which exports U.S. horticultural products.

After the acquisition of GardenAmerica's distribution sites, Weyerhauser will have growing operations or distribution facilities in 16 states, including 10 of the 11 largest metropolitan areas in the U.S. GardenAmerica's distribution arm serves more than 6,000 retail outlets including independent retail garden centers, home centers, mass merchandisers, drug and grocery stores.

Robin expands U.S. network

Carswell Import and Marketing Associates, Inc., the sole U.S. importer and marketing agent for Robin Outdoor Power Products of Japan, has added eight new distributors. CIMA now has 27 Robin distributors. Robin products include professional grass trimmers/brush cutters, backpack blowers, sprayers, hedge trimmers, water pumps and engines.

Formulator/distributors vie for new herbicides, PGRs

Some chemical manufacturers are listening to proposals from regional and national distributors for reformulating and marketing their new products. Two primary products are mentioned most, preemergence herbicides and plant growth regulators. The products are not yet labelled for turf.

The manufacturers, often torn between marketing the products themselves through existing semi/ag sales forces or strong distributors, are leaning more heavily to the distributor. Reformulating ability and marketing skill are of most concern to the manufacturers. Mentioned most often are PBI/Gordon, Scotts, Lesco, United Agri Products, The Andersons, and Lebanon.

You might think these companies could be called manufacturers as well as distributors, and you'd be right. Distributors without reformulating capability and labelling agreements with chemical manufacturers face buying product from their own competitors if the trend continues.

In-the-Middle covers the turf and landscape distributor and dealer. Distributors are invited to send news items to Weeds, Trees & Turf, 7500 Old Oak Blvd., Cleveland, OH 44130.

The new division will operate under Vice President Robert L. Scofield.

Environmental Care, Inc. is a subsidiary of Environmental Industries, Inc.

ASSOCIATION

Calif. plantscapers encouraged by start

The election of officers is the next order of business for the new Professional Interior Landscape Association (PIPA) of Southern California.

More than 200 persons attended PIPA's inaugural meeting in mid-May. "Our goal is not to replace the national organizations but to supplement them," says Lydia Paneri, a member of PIPA's ad hoc formation committee. "I think we can be effective in providing seminars and educational programs to all people involved with interior plantscape and not just the owners and operators."

Paneri tells WEEDS TREES & TURF the new association already numbers about 100 members and "is getting a good response from suppliers."

INDUSTRY

E-Z-GO strengthens utility vehicle line

Officials at E-Z-GO Division of Textron are knee-deep in the development of a national distribution network for a growing line of industrial vehicles.

This past February the Augusta, GA, based manufacturer of golf cars unveiled a line of industrial vehicles and on June 4 announced the purchase of the assets of Eagle Vehicles, Inc., Dallas, TX, manufacturer of the Pargo Industrial line.

"We now have 19 different style units," E-Z-GO spokesman Bill Manning tells WEEDS TREES & TURF. "We have everything from a one seater to an 11 passenger model. Our acquisition of the Eagle Vehicles was a good mesh, a perfect marriage."

Manning says the introduction of new models this past winter and the purchase of the Pargo line makes E-Z-GO "one of the leading contenders in the three and four wheel, gas and electric industrial vehicle market."

INDUSTRY

3,500 attend Lesco seminars

More than 3,500 turf professionals attended educational seminars in

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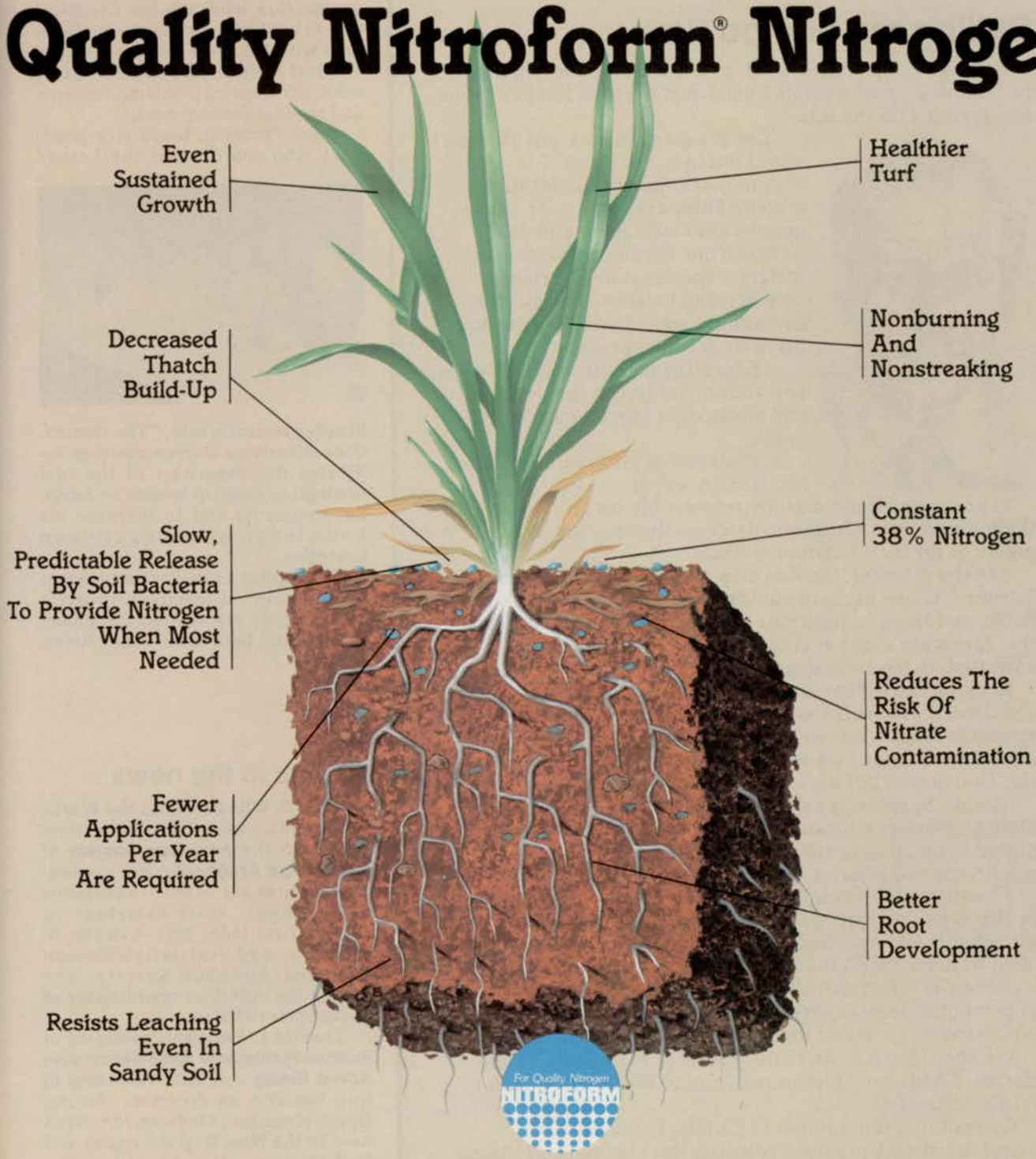
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Circle No. 129 on Reader Inquiry Card

by **Ron Hall**, associate editor

Selling ma and pa first

Selling life insurance used to be a matter of easing ma and pa behind a pot of steaming black coffee at the kitchen table, and laying it on the line.

'Yes, it's going to cost, but you can't afford *not* to.'

And that's the way better turf athletic fields are going to be sold—nose to nose with mom and dad.

Says Tom Turner, an extension turfgrass specialist in Maryland, "we're going to have to *create* the demand for good fields." He outlines three steps in the process:

1. Educating parents, school boards, and administrators on the desirability and advantages of well maintained fields.

2. Convincing these same groups funds are needed.

3. Educating those directly responsible for and involved in the maintenance of athletic fields on the recommended practices for their location and use.

"At the moment, the first step is the most critical," says Turner. "Those using the fields, parents of children using fields, and those in positions of responsibility who can see that funds are made available, need to be reached and educated on the advantages of quality athletic fields."

In stumping for better turf ball fields we can drone on about decreased soil erosion (yawn) or improved aesthetic appeal (ho hum), but we're not going to put a charge into mom and dad until we get them thinking about junior and sis. That means talking kids and safety.

Thanks to recently released research by a group of Penn State University educators we can back up what we've hinted at for so long: there is a connection between field conditions and injuries.

The study, involving 12 high school football teams, began in 1981 when researchers assessed conditions on practice and game fields and matched them with injury data submitted by team trainers. Of all injuries reported, 21 percent were classified as either definitely or possibly field related. About 41 percent of knee injuries and 47 percent of ankle/foot injuries were (or could have been) linked to field conditions.

We should make use of the efforts of Penn State's Jack Harper, Chauncey Morehouse, Donald Waddington, and William Buckley.

Considering the number of athletic fields (6,000 in Maryland alone), previous research linking field conditions to injuries has been sparse, almost non-existent.

"This type of information needs to reach parents, administrators, and field managers," says Maryland's Turner.

Sports turf managers would do well to get themselves a pot of steaming coffee and gather some folks around a table.

A successful "sell" could give a community or school a more attractive—and safer—ball field.

states sponsored by Lesco, Inc. in the first quarter of 1985.

The seminars, a series of 18 held in conjunction with Stauffer Chemical Co., 10 held with Monsanto and three held with 3M, were designed to educate turf professionals in product use, solutions to spring problems, research and product development.

Gene Probasco, Lesco vice president who coordinated the Lesco/

Stauffer seminars said, "The tremendous attendance at these meetings indicates the eagerness of the turf manager to keep up-to-date on recent developments and to increase his knowledge of products and strategies."

(To request a speaker for turfgrass or horticultural meetings, program chairpersons are invited to contact Lesco, 20005 Lake Road, Rocky River, OH 44116.)

PEOPLE

Names in the news

Cynthia E. Wilson knows the Washington D.C. scene, a plus in her new post with the **American Society of Landscape Architects**. Her credentials include a stint with the Interior Department, staff assistant to former first lady, Mrs. Lyndon B. Johnson, and legislative liaison with the Audubon Society. She serves the ASLA as coordinator of government affairs.

Theresa L. Pesapane, president of **Interior Plantscape Association** says **Alfred Emsig** and **B.M. Veldkamp III** join the IPA as directors. Emsig, Bough Haus, Inc., Medway, MA, takes over in the New England region and Veldkamp, Plantscaping by Veldkamps, Lakewood, CO, is director of the West and Northwest.

In related news, **Forrest T. Mullins**, Washington, D.C., recently began day-to-day administration of IPA programs as associate executive director. He will also manage the IPA annual meeting and trade show set for Oct. 15-19 at the Rivergate Convention Center, New Orleans.

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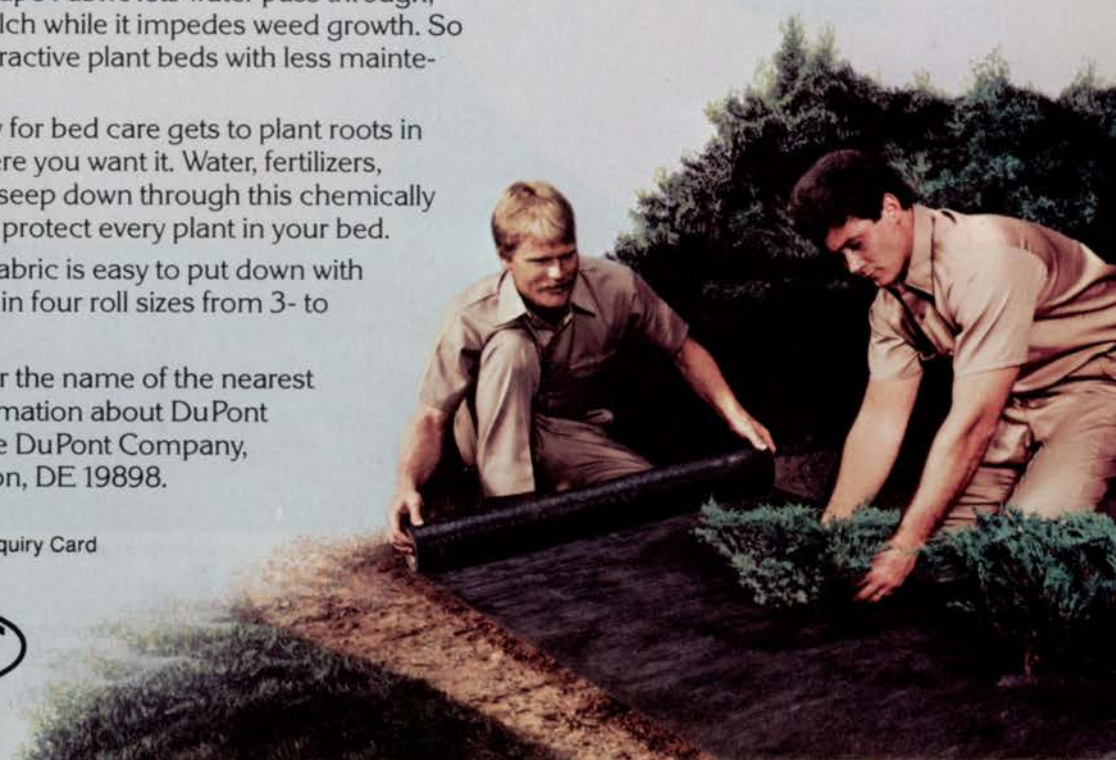

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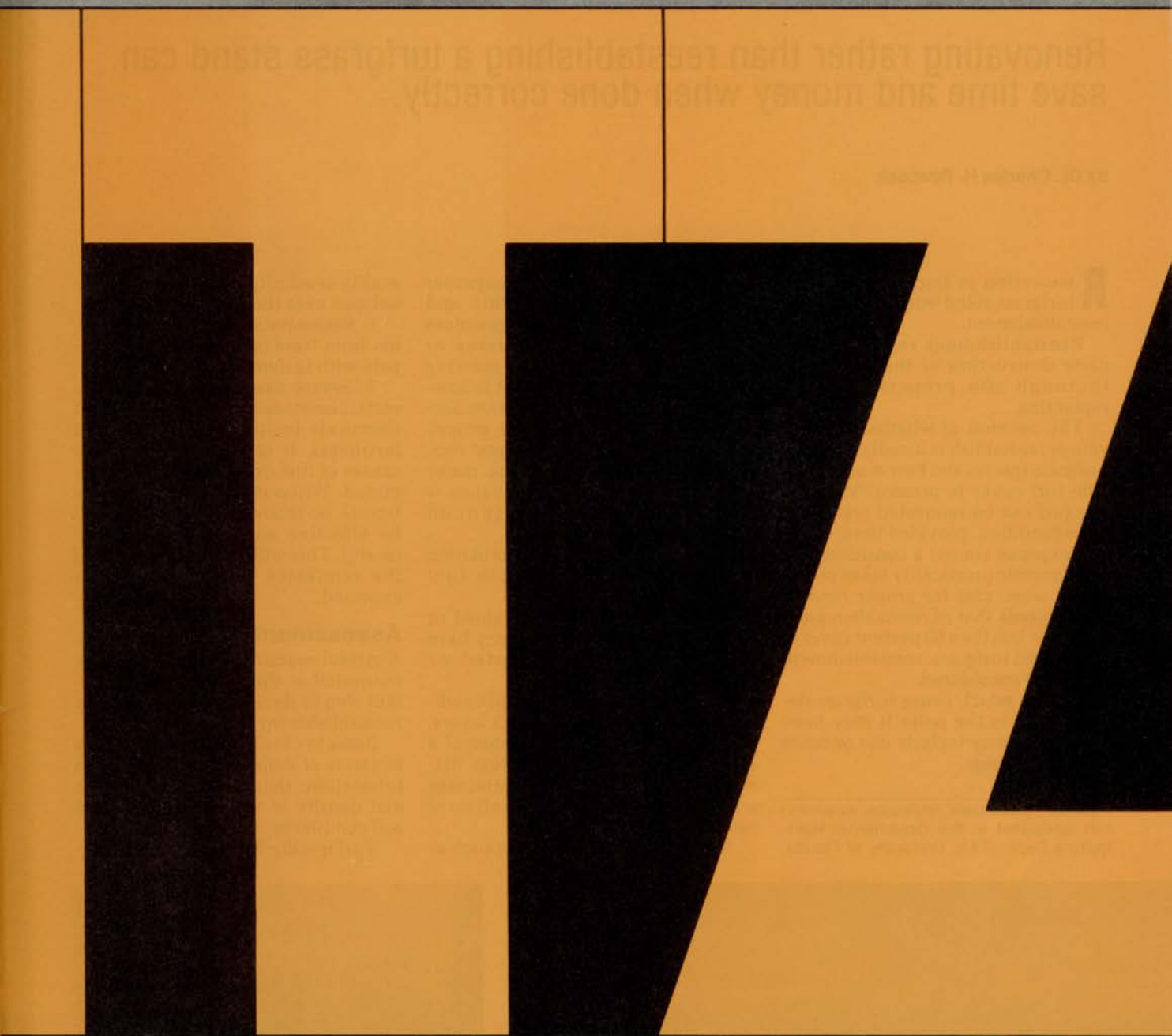

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Warm Season Renovation

Renovating rather than reestablishing a turfgrass stand can save time and money when done correctly.

by Dr. Charles H. Peacock

Renovation is improvement of a turfgrass stand without complete reestablishment.

Reestablishment refers to complete destruction of the old stand, thorough site preparation, and replanting.

The decision of whether to renovate or reestablish is usually based on turfgrass species and how much desirable turf cover is present. Virtually any turf can be renovated regardless of its condition, provided time, effort, and expense are not a consideration.

Economic practicality takes precedence when cost for proper renovation exceeds that of reestablishment. If there is less than 60 percent cover of the desired turfgrass, reestablishment should be considered.

Factors which cause turfgrass deterioration to the point it may need renovation may include one or more of the following:

Peacock is assistant professor, extension turf specialist in the Ornamental Horticulture Dept., IFAS, University of Florida.

1. Poor management by improper cultural practices which thin and weaken turf. Among these practices are using unadapted species or cultivars; using improper mowing height or frequency; and not following state Cooperative Extension Service recommendations for proper fertilization, irrigation, and pest controls. This is commonly the major problem where turf maintenance is practiced by inexperienced personnel.

2. Excessive thatch accumulation which has occurred since turf establishment.

3. Predominance of unadapted or undesirable species. These may have been unknowingly planted or introduced.

4. Undesirable physical soil conditions such as compaction, rock layers, buried foreign matter, presence of a severe layering problem from dissimilar soil textures, or poor drainage which was not corrected at the time of establishment.

5. Chemical soil conditions such as acidity or salinity which may have developed over time.

6. Excessive shade and root invasion from trees or shrubs which compete with turfgrass.

7. Severe damage by diseases, insects, nematodes, or the toxic effect of chemicals including pesticides and fertilizers. It is important that the causes of turf deterioration be determined. Without correction of these factors, no renovation procedure will be effective and 100 percent successful. This will result in a failure of the renovated turf to perform as expected.

Assessment of Turf

A careful examination of the turf to be renovated is the single most important step in deciding if renovation or reestablishment is required.

Items to check include turf quality in terms of density, color, and weed infestation; thatch thickness; depth and density of the root system; and soil conditions.

Turf quality is important in deter-

Examination of a cross *section of the turf before and after vertical mowing shows how much thatch and above ground vegetative material has been removed by this procedure.*

Vertical mowing bahiagrass *with too narrow a blade spacing will severely thin the turf and limit recovery.*

mining degree of renovation to attempt. Turf that is excessively springy or spongy but has fairly good color and density and minimal weed contamination is healthier and can be more severely renovated than turf that has deteriorated to the point it has become thin and weed-infested.

Thatch thickness and root density will determine how extensively turf can be vertically mowed during renovation.

The first step should be an examination of the root system by grabbing a handful of turf and trying to pull it out of the ground. Sparse or shallow-rooted turf is easily pulled out of the soil. Vertical mowing poorly rooted turf in a weakened condition is not advised.

The mechanical slicing action may loosen and strip turf from soil in patches.

Virtually any turf can be renovated regardless of its condition.

Carefully shake or wash soil and/or organic matter from the sample to expose roots and their density. There are no quantitative guidelines for root system evaluation relative to vertical mowing, but successful renovation becomes more difficult as root system depth and density decreases.

A majority of the root system should extend a minimum of six or more inches in the soil. A healthy root system will include a large number of fibrous white roots in the sample.

Thatch thickness should be examined from a cross section of the turf profile which can be removed using a garden spade. Thatch layers greater than one inch are excessive and should be removed. This examination should provide a rough quantitative estimate of how much thatch can be removed during vertical mowing and still leave adequate green vegetation for regrowth afterward.

Steps in Renovation

If undesirable weeds or grass species are a problem, a decision must be made whether to use a selective or non-selective herbicide for weed control.

Presence of a large population of weedy perennial grasses usually dictates spot treatment with a non-selective herbicide. Glyphosate (Roundup) is translocated to the growing points and is more effective than contact materials. Check current Cooperative Extension Service recommendations on weed control if selective treatment is desired.

Advance planning is necessary for this procedure since this may delay other steps. Removing weeds will reduce competition within the turf stand and allow for faster recovery from the renovation procedure.

To Remove thatch and dead vegetation, locate and flag any irrigation heads, electrical outlets, and other obstructions which may be damaged by equipment.

Adjust cutting height as low as compatible for the mower based on the grass being renovated. Because they are strongly stoloniferous and rhizomatous, poorly rooted bermudagrass and zoysiagrass may have much of the above ground vegetation and thatch removed by mowing (or scalping) at a low height of cut. This is not effective for thatch removal, but may precede vertical mowing in the renovation process.

Scalping of centipedegrass and St. Augustinegrass is not advised since it may remove most of the stolons from which regrowth must occur.

Bahiagrass is rhizomatous, but density is lower, and it may be severely injured by scalping. A grass catcher, vacuum or sweeper should be used to remove clippings during or after mowing prior to vertical mowing.

For vertical mowing use a blade spacing recommended from Table 1. Selection of a blade spacing closer than these suggestions may result in removal of too much vegetative material thus damaging grass beyond its recuperative potential.

Set the depth of cut so that as much thatch as possible is removed. If possible, set the blade depth to just penetrate the soil thereby cultivating and topdressing at the same time as dethatching.

If turf rooting and density permit, vertical mow a second time at right angles to the first direction. The decision to vertical mow a second time will depend on how severe the first procedure was for removal of green vegetation.

Thatch and debris brought to the turf surface must be vacuumed or raked and completely removed. A final mowing will smooth the turf surface.

TABLE 1.
Recommended vertical mower blade spacings for warm season grasses.

GRASS TYPE	INCHES
Bahiagrass	2.0 - 3.0
Bermudagrass	1.0 - 2.0
Centipedegrass	2.0 - 3.0
St. Augustinegrass	3.0
Zoysiagrass	1.0 - 2.0

Topdressing

Topdressing can be applied to level renovated areas.

Topdressing materials should be similar to the native soil and light applications are desired. Never bury turf with topsoil since this may smother and kill turf or create undesirable layering in the turf profile.

Verticle mowing poorly rooted turf in a weakened condition is not advised.

Cultivation

If severe compaction at the soil surface or a layering problem is present in the upper two inches in the soil profile, cultivation should be considered. This will improve aeration and water penetration and reduce surface layering problems.

Core cultivation or aeration is preferred although grooving and slicing may also be used. From two to five repeat cultivations may be necessary.

If core cultivation is done, vertical mowing or dragging of the area with a steel dragmat may be necessary to break up cores and scatter soil over the surface. Core cultivation does not remove excessive thatch and should complement, not substitute for, vertical mowing.

In areas which are severely thinned during the renovation procedure or if they were bare areas prior to renovation, seeding or vegetative planting should be done as the next step.

Sprigs removed during vertical mowing are an an excellent source of vegetative material provided they are not contaminated with perennial weeds or other undesirable grass species.

continued on page 24

4. RENOVATION IN PROGRESS DAY 15

1. SPRAY
DAY 1

2. SLICE
DAY 10

3. SEED
DAY 10

5. COMPLETED
RENOVATION
DAY 30

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RENOVATION *from page 21*

Post Renovation Care

Renovation is a temporary setback to actively growing turf because it reduces the turf's ability to synthesize plant food due to removal of green grass blades.

Recovery is more rapid if turf is properly fertilized immediately following renovation. The soil should have been tested for pH, phosphorous (P), and potassium (K) levels prior to the renovation procedure.

It is extremely important during the period immediately following the renovation procedure that new rooting occur.

Correction of pH is suggested at this time or the lime spread and worked into the soil profile during cultivation, if performed. In lieu of a soil test a 16-4-8 fertilizer with micronutrients is suggested at a rate which will provide 1.0 lb. of soluble nitrogen per 1000 sq.ft. Dead organic matter exposed in renovated areas dries quickly and becomes hydrophobic.

This further stresses renovated turf which is weakened and less able to withstand water stress. Thus, renovated turf should be treated as a new installation and should be lightly irrigated twice daily until the turf develops a deep root system which is capable of surviving with less frequent, but deeper watering.

Other normal maintenance practices including mowing and control of insects and disease should be resumed immediately following renovation. Weed control can be a serious problem since renovation may expose soil and bring weed seed to the surface.

Use of a preemergence herbicide for weed control is not suggested since many of the preemergence materials inhibit root formation.

It is extremely important during the period immediately following the renovation procedure that new rooting occur. Weeds are better handled postemergent after the first mowing.

Consult the local Cooperative Extension Service office for details on the best choice of weed control materials for your area. **WT&T**

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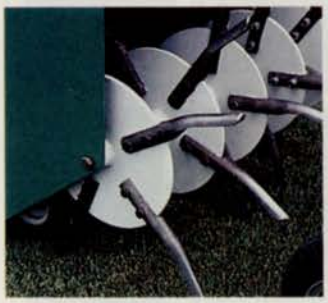

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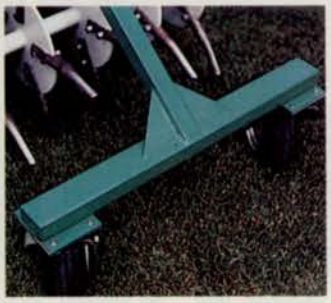

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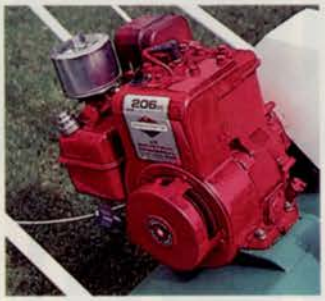

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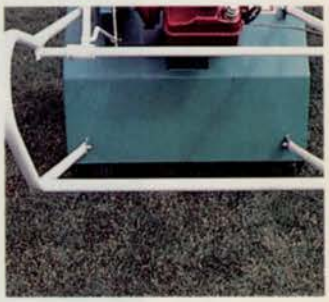

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LESCO

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Turf Nutrient Needs

Determining a soil's nutrient deficiencies is the first step in assuring healthy turfgrass.

by R.P. Freeborg and W.H. Daniel

Good turf maintenance requires the addition of nutrients which will force new growth as well as counteract wear, disease damage, and aging of turf.

This procedure helps to override weed competition and replace nutrients that are lost through leaching, fixation, volatilization, and clipping removal.

Both plant tissue and soil tests have been developed to assay the available nutrients in the soil, to predict plant utilization, and to provide a basis for determining nutrient needs. Before applying nutrients it is important that the soil be tested. This is especially important if lime is to be applied.

Freeborg is an agronomist at Purdue University. Daniel is a retired professor, Purdue University.

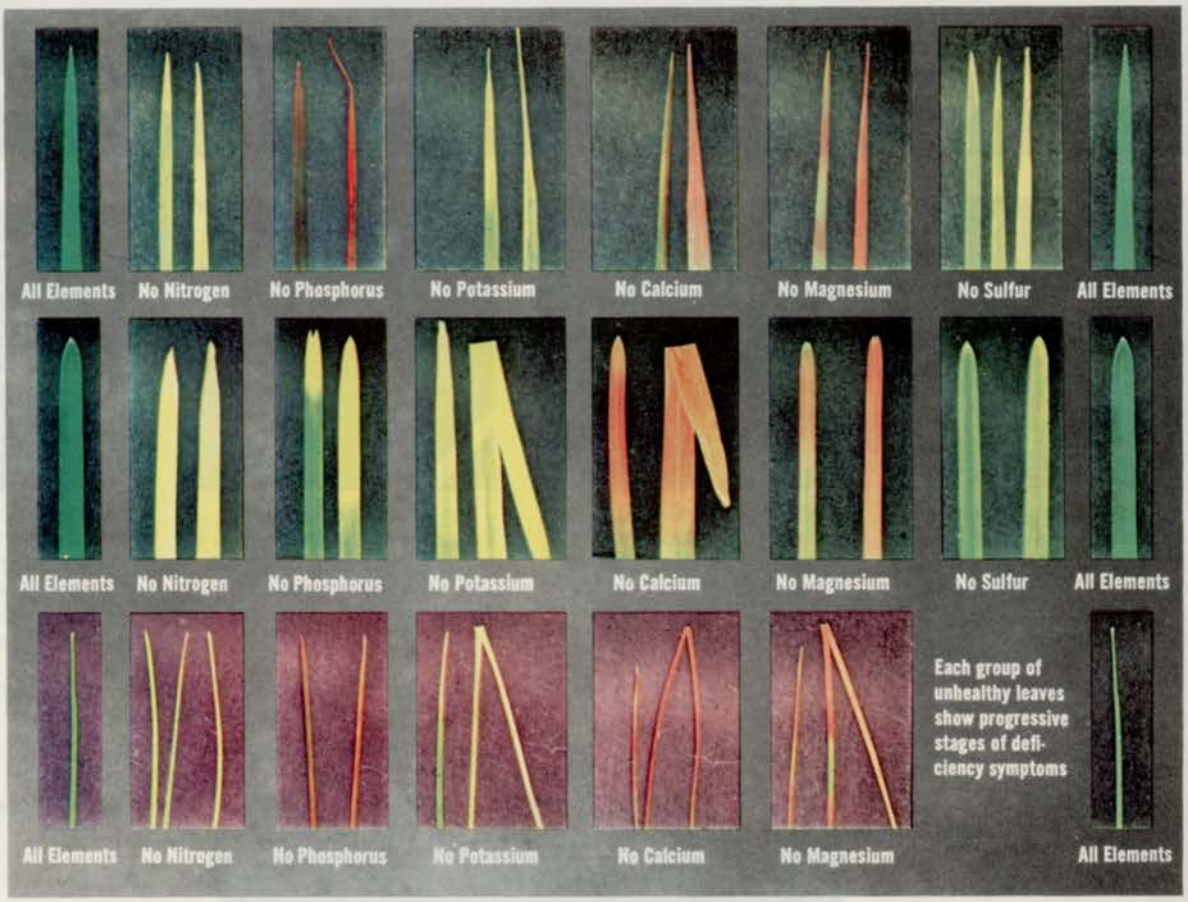
Turfgrass with *phosphorus deficiency symptoms.*

Determining deficiency

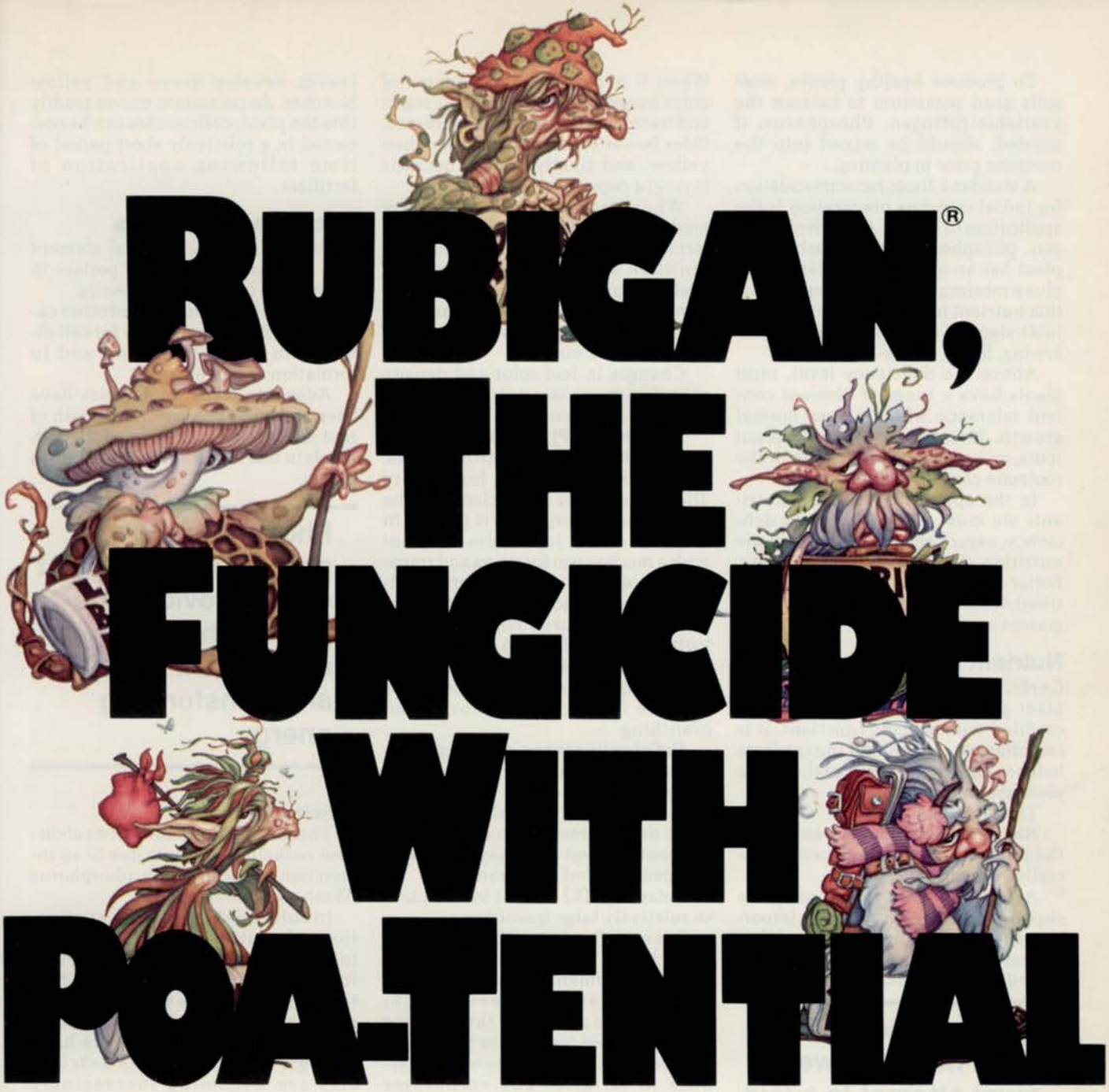
Determination of nutrient deficiency is based on the least fertile soil within the project area. Maximum fertilizer should be used initially in order to produce a good turfgrass or plant growth cover and to correct existing soil deficiencies.

All soils need supplemental nitrogen to maintain fast, vigorous growth of turfgrasses and other ornamental plants. Some soils need additional phosphorus, in the upper soil for turf or in the active rootzone for other plants, to assure an adequate supply.

TABLE 1.



Foliar symptoms of six essential nutrient deficiencies in three cool-season turfgrasses. (Photos courtesy of O. J. Noer Research Foundation, Milwaukee, Wis.)



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To produce healthy plants, most soils need potassium to balance the available nitrogen. Phosphorus, if needed, should be mixed into the rootzone prior to planting.

A standard, basic recommendation for initial rootzone preparation is the application of 100 lbs./A each of nitrogen, phosphorus, and potash. Each plant has an optimum nutrient range plus a minimum nutrient level. Below this nutrient level, plants begin to exhibit signs of deficiency such as yellowing, firing, or die-back.

Above the deficiency level, most plants have a range of element content tolerance which allows normal growth. Excessive uptake by plant roots, or unbalanced nutrients in the rootzone can cause toxicity.

In the application of plant nutrients we must attempt to avoid deficiency, assure and maintain adequate nutrition, and yet prevent toxicity. Foliar symptoms of six essential nutrient deficiencies in three cool season grasses are illustrated in Table 1.

Nutrient sources

Certain elements are essential to plant growth. Although each one is credited with specific functions, it is important to understand the intricate balance and interrelation of the entire plant growth process.

The major elements are:

Nitrogen (N) is the key element in the production of plant growth, especially turfgrass.

A proper balance and adequate suppply of other nutrients is important and is generally maintained, but the amount of nitrogen should be adjusted for the desired growth response. Variation in the available nitrogen determines the greenness of the leaves, ability to recover from damage or stress, and the quantity of clippings that grass produces.

In the application of plant nutrients we must attempt to avoid deficiency, assure and maintain adequate nutrition and yet prevent toxicity.

Nitrogen affects the grass color, root and shoot growth (density), resistance to disease, cold and heat, and tolerance to drought.

Nitrogen is a mobile element. When it is deficient the proteins of older leaves are converted to nitrogen and transported to the younger leaves. Older leaves become light green, then yellow, and finally, before necrosis (dying) a copper yellow.

When turfgrass tissue tests are made the new leaves are used to determine nutrient content. The most sensitive and accurate measure of available nitrogen in the plant is obtained by tissue test. For turf, the quantity of clippings is the second most accurate measure.

Changes in leaf color and density of turfgrass are less accurate indicators of nitrogen supply.

Phosphorus (P) has been labeled as the workhorse of the nutrition team.

It is taken into plants from a very dilute solution by ion exchange at the root surface. Phosphorus is present in every plant cell. It provides the plant with a mechanism for using and transforming energy. A phosphorus deficiency is reflected in new plant parts.

The phosphorus content in dry turfgrass ranges from .15 to .55 percent P, with 0.3 to 0.4 percent as an average. Adequate levels of phosphorus promote rooting and improved root branching.

Deficiency causes a reduction in tillering and moisture retention. Leaves become more narrow and have a tendency to curl. Leaves become darker green, with some purple pigment evident and they develop a decidedly wilted appearance.

Potassium (K) is used by the plant in relatively large quantities.

It is not a fixed constituent of living cells, but is essential to the growth and development processes. Potassium furthers the development (thickness) of cell walls, thus making the plant more resistant to heat, cold, and frost. It also increases wear tolerance in turfgrass and encourages rooting.

High potassium levels tend to reduce damage caused by dollar spot, fusarium blight, brown patch, and red thread diseases of turfgrass.

Potassium's role is that of a regulator of plant processes. It influences at least 46 enzymes, and controls the uptake of some nutrients. Low oxygen supply in the rootzone reduces the effectiveness of potassium because roots must have oxygen to utilize the elements.

Dry turfgrass tissue may have a range of 0.9 to 4.0 percent potassium, but 2-3 percent is normal. Potassium deficiencies are first indicated by drooping leaves, which feel soft to the touch.

Necrosis of the leaf tip is preceeded by a reduction in foliage density. The leaves develop green and yellow blotches. As potassium moves readily into the plant, deficiencies can be corrected in a relatively short period of time following application of fertilizer.

Secondary elements

Calcium (Ca) is a structural element that accumulates calcium pectate in the middle lamella of cell walls.

It regulates the balance of other cations. Calcium is necessary for cell division in apical meristems and in formation of flowers.

Adequate levels of calcium have been shown to improve the growth of root hairs. Calcium is fixed at high levels in leaf tissue and is immobile in plants.

Phosphorus is present in every plant cell. It provides the plant with a mechanism for using and transforming energy.

Sulfur (S)

There have been indications of disease reduction in plants due to an interaction of sulfur with phosphorus (Washington State study).

In sulfur deficient soils, applications of a nitrogen-sulfur ratio of 7 to 1 is recommended. Earlier, sulfur was obtained through industrial fall-out and as a component of many pesticides and some low grade fertilizers. Since these have been greatly reduced, the deficiencies are becoming increasingly evident.

As a consequence, applications of sulfur may be needed.

Micronutrients include seven elements known for their essential contribution to plant growth. Special tests help estimate the soil supply of micronutrients and determine if additions are needed.

Tissue tests are usually more accurate indicators of the available nutrient supply. If micronutrients are needed, either solid forms as mixed fertilizer or liquid as in dilute foliage sprays may be used at critical states of plant growth.

The soil's nutrient requirements may vary according to soil type, pH, organic matter content, moisture, or stress created by excesses of other nutrients.

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Iron (Fe) functions in certain respiratory enzyme systems. Its presence is essential for the formation, but it is not a constituent, of chlorophyl.

It serves as a catalyst in the reduction of nitrates. As iron is immobile in the plant, new tissues will tend to develop interveinal yellowing (chlorosis) when deficient.

The blades tend to lose color, (almost white), but necrosis is minimal. Wet or cold soils are conducive to iron deficiency. The solubility of iron decreases as the pH becomes more alkaline.

Iron content in turfgrass clippings is normally 5 ppm, but has great variability. In soils the normal ratio of available iron to manganese is 2 to 1.

A standard foliage spray for correcting iron deficiency in turfgrass is 2-3 pounds of iron sulfate per acre or 1 ounce per 1,000 square feet. An application of a 3 percent solution at seven to 14 day intervals is recommended during stress periods.

Potassium deficiencies are first indicated by drooping leaves, which feel soft to the touch.

Grasses are considered tolerant to low iron availability.

Manganese (Mn) is necessary for absorption of CO and for transforming carbohydrates.

Like iron, it is not a constituent of chlorophyl, but activates its synthesis. Manganese is more abundant in leaves than in other plant parts, but is immobile.

The manganese level in soils is usually adequate but anaerobic soil conditions (limited oxygen) can create an increase in Mn availability and concurrently favor iron deficiency. Alkaline conditions or intense leaching favor manganese deficiency.

Yellowing or striping between veins, along with stunting, curling or spotted turfgrass leaves may indicate a deficiency.

Deficient tissue has a very soft feel and the leaves tend to bend, giving them a very limp appearance.

The expected range of Mn in dry plant tissue is 22 to 140 ppm. A recommended spray to correct manganese deficiency is 1 to 2 pounds of manganese sulfate per acre. One or two applications may carry through a growing season.

Zinc (Zn) improves reproduction capabilities and is vital to oxydization processes within the plant. The plant requires only minute quantities of zinc.

It is not a component of chlorophyl, but like iron and manganese, it is required for chlorophyl synthesis. Zinc is immobile in the plant.

Dark, thin, desiccating leaves, which turn white in advanced stages, along with yellowing and bronzing of stunted leaves, witches broom, and reduced growth are symptoms of zinc deficiency.

Compaction, excess irrigation, and alkaline conditions reduce the availability of zinc to plants. Because zinc is readily fixed (made unavailable) in the soil, the surface soil accumulates a higher concentration of zinc than the lower soil levels.

Excess phosphates in soil precipitate insoluble zinc conditions. A range of 8 to 60 ppm of zinc in dry tissue is normal. To correct zinc deficiency an application of 0.4 to 0.8 pounds per acre of zinc sulfate is recommended.

Copper (Cu) is an activator of some enzyme systems and certain growth promoting substances. The copper content in a plant is highest in actively growing tissue. Copper is toxic except in dilute proportions. Water from copper downspouts can cause areas of turfgrass to be stunted.

Organic soils tend to be deficient because substances released as organic matter decay and tend to limit the availability of copper.

Boron (B) is necessary for plant reproduction and is related to calcium and phosphorus metabolism and protein synthesis. It affects the development of the plant cell wall, and is thought to be active in sugar transfer. It also aids in maintaining correct water balance in plants.

The new leaf tip has the highest concentration of boron within the plant. Because the leaf tips are removed by mowing, for limited periods turfgrass can tolerate higher boron concentrations than other plants.

Availability is reduced under alkaline conditions. Deficiencies of boron are evident in the growing points as chlorotic streaks. Also, the leaves are stubby and rosette-like in appearance.

Some plant stems become brittle and leaves become mottled.

The normal range of boron in dry plant tissue is 3 to 20 ppm. The normal boron concentration in the soil is 2 to 1,000 ppm, with an average of 30 ppm.

A corrective application of boron requires 0.1 to 0.3 pounds per acre. Where a deficiency exists, the maximum amount required for any boron sensitive crop is only 1 to 4 pounds per acre.

Molybdenum (Mo) is believed to be necessary as an activator for the enzyme regulating nitrate reduction. It is essential in the process of nitrogen fixation. Wilting, stunting, and cupping of leaves are possible symptoms of molybdenum deficiency.

Concentration of molybdenum is highest in the leaf blade and tends to accumulate in plants as they mature. Molybdenum, like zinc, tends to accumulate near the soil surface as a result of plant decay and subsequent release of this micronutrient.

Leaf tissue to be used for testing should be dried before any deterioration occurs.

It is less available under acid soil conditions. Applications of lime to acid soils can improve availability.

The expected range of molybdenum in dry tissue is 2 to 8 parts per million, but plants with tissue contents of 11 to 15 ppm were produced on soils high in molybdenum.

Corrective treatment of soils lacking Mo is 0.1 pounds per acre.

Preparation for Testing

Leaf tissue to be used for testing should be dried before any deterioration occurs.

The clippings of leaf tissue may be dried by spreading them in a thin layer on a clean surface in the open air and sunshine. Stirring the leaves occasionally helps them to dry uniformly.

They may also be dried in a warm (not hot) oven for a limited time. It is suggested that approximately one pound of fresh leaf tissue be dried out though only a few grams of tissue are actually needed for the laboratory test.

The sample container should be clearly labeled. Information and questions concerning the sample can be helpful in securing more complete interpretation of the data.

The following Table 1 (from page 26) Turf Managers Handbook, Daniel & Freeborg, is an example of tissue analysis showing the range of elements within a plant. Such an analysis can serve as a basis for interpretation and correctvie action. Soil testing laboratories will supply additional information on processing tissues for testing. **WT&T**

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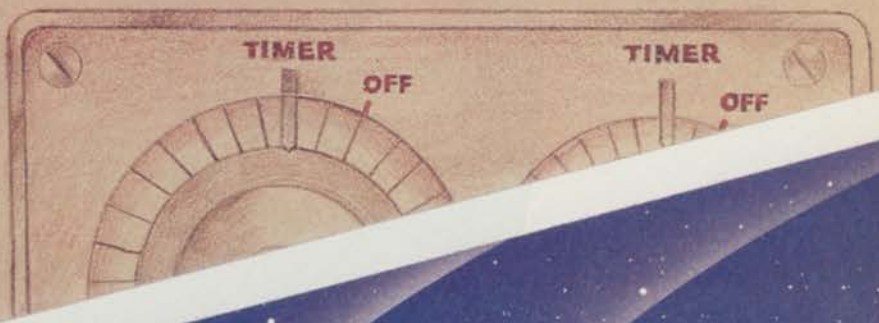

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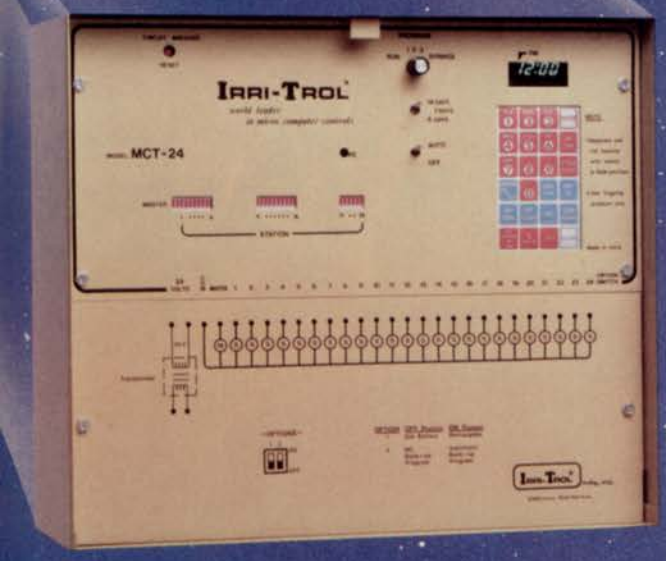

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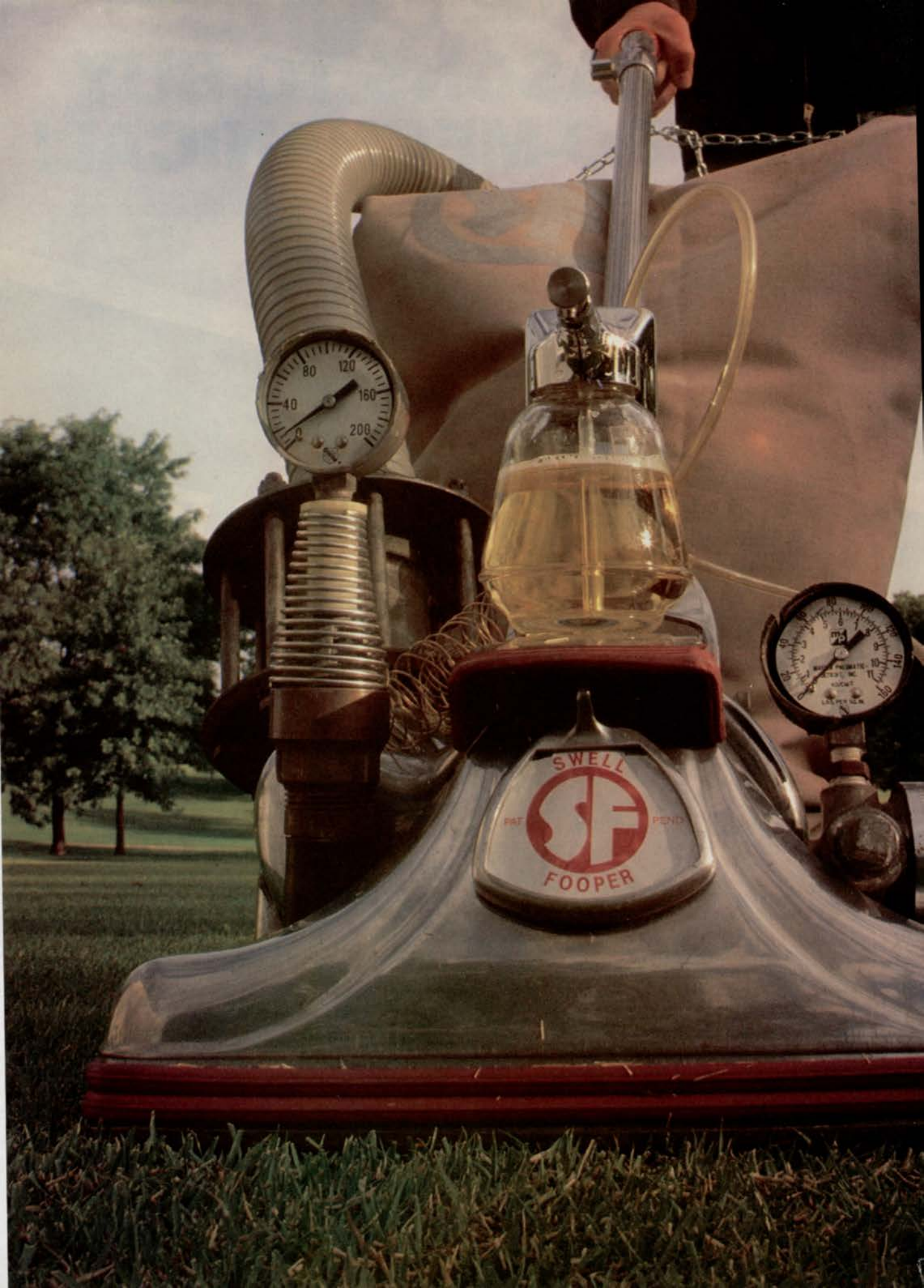
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Building the Team

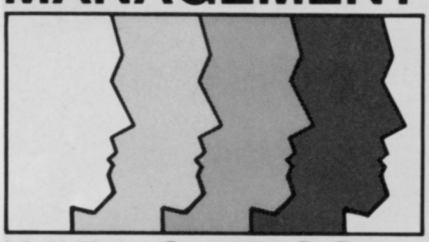
Hiring and retention of personnel is the cornerstone of any business's success. Understanding the components of recruiting qualified employees is half the battle.

by Rudd McGary and Ed Wandtke

("Building the Team" begins the first in a three part series on team management. Parts II and III will appear in the September and October issues, respectively.)

PART 1

TEAM MANAGEMENT IN BUSINESS



There are a great many questions that come up when discussing how to hire and develop a successful workforce and develop it into a productive team.

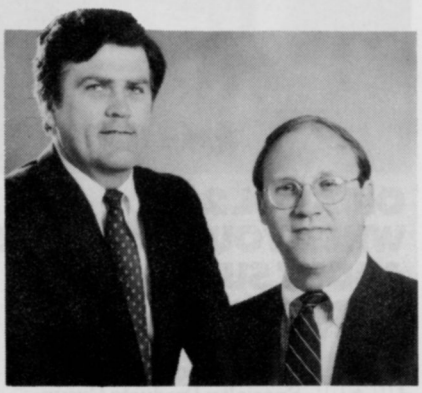
Let's first define what teams are outside of sports and then go on to the major questions of hiring and recruiting of personnel that will make up your team.

Common objective

Teams are two or more people working towards a common objective within a given timeframe and with a strong central management or leadership function present.

If any of these parts are left out you simply won't have a team. The common objective must be understood by all the people you hire and all the people that are currently on the team, your employees.

Unless there is some reason for the team's existence, and that reason is to accomplish something, you can't hire or recruit anyone. You should note that often different parts of your team have different specific objectives, but that overall the team has to understand how those different parts fit together toward one unified goal.



Wandtke and McGary are partners in All-Green Management Associates, Columbus, OH.

One division may be working on obtaining more customers while another division may be working on profit improvement through reducing cancels, improved quality of service or more frequent customer communications. A second part is the timeframe that you expect a specific task or objective to be accomplished in.

Don't say, "We want to give better service by next year," because the time frame is too long. While that may be your final objective you have to give the team members short term objectives so that they can have the feeling of accomplishment and understand how they are expected to perform in a given space of time.

A more realistic goal would be: Cancels for round 1 will be 35 percent below last year's round 1 cancels.

The third major part of the team concept is that there must be a strong central figure that is in charge. In sports this is a coach, in business it's the manager/owner.

The coach

Telling a group of people that you want them to work like a team is useless unless you have someone who is reponsible for the performance of the team. The reason why committees take so long to get things done is usually the fact that no one person is in charge.

Companies need the strong management function in place all the time. This last statement doesn't mean that you have to beat people over the head all the time, simply that responsibility for the team's performance is with the manager. They don't fire the players in baseball, they fire the managers.

In business we often see the reverse; they fire the subordinates and leave the management in place. A true team's performance is the reponsibility of the top man, and there is no way that a good team manager can give up that responsibility, or should want to.

Let's look at how building a successful team starts with the hiring and recruiting of all your personnel.

Below are some key points to consider.

- 1. When hiring be sure you have a specific function for the new team member. It isn't enough to hire bodies. You must be aware of the reasons why that person is being brought into the team. Over-staffing is expensive.
- 2. You should have some standards of operations and performance that are made clear to the new team member.

Frequently people who are hired, particularly in part-time positions, don't really know what is expected of them. Don't have employees just standing around when there is no specific task to do, have them check back with their manager.

- 3. During the hiring interview make sure it's really an interview, not just a sales job by you to get them to come to

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work for you. Know what you want to find out in the interview, and then stick to it until you do find it out. You can do this best by writing down what you want to know before you begin the hiring interview. Be consistent in obtaining a standard body of information about each job applicant.

■ 4. Not everyone on the team has to be a superstar. You're going to hire mostly people who do standard jobs. When you're hiring consider the fact that most teams have a few superstars and then a lot of good workers around them. You can't expect everyone on your team to be great at what they do, particularly if their position doesn't require greatness, just competence.

■ 5. There are two major ways to find new people. One way is to advertise in newspapers or magazines. This will bring responses from anybody that thinks they can do the job described and gives you a broad base to work from. A second way is to use personal references from those that are already working for you. A good worker generally wants a good worker next to him or her and should be encouraged to suggest new people for job openings.

■ 6. Plan as far ahead as possible for hiring. If you trap yourself into having to hire anybody who applies for a job because you put yourself under time pressure, you won't put much of a team together and you deserve what you get.

When you're hiring consider the fact that most teams have a few superstars and then a lot of good workers around them.

■ 7. Keep a list of those people that you've interviewed. Sometimes three people interview for a job and all three are almost as good. You still have to choose one but if you keep a list, with comments, you can help yourself if you get in a hiring crunch. (Throw away the peoples' names that didn't make a good impression in the interview, generally they won't get any better.)

■ 8. Make sure you have minimum standard for hiring. Everybody puts together a profile of the perfect employee. They are hard to find. You have to set a minimum standard. Never go below this.

■ 9. Don't expect to find too many great team members when you're hiring entry level personnel. Consider the position and the salary when you begin your interviews. Sometimes you can get lucky and find extraordinary people at low prices. Sometimes it rains in the Sahara desert, too.

■ 10. Do the interviews in person. Resumes and phone interviews give you some idea of the person but since you are recruiting for your team do it yourself to be certain the individual will meet your standards and complement the needs of the team. Putting a team together is not an easy process. Managing it is even tougher.

If you start with a good hiring process at least you have a better than even chance at getting the people you want. If you start with a mediocre group of people chances are you will put together a mediocre team. **WT&T**

Next month's column will deal with motivation of teams. One preview thought. Hiring of the team will be a key variable in the success of the team. All the great coaches were good at getting great personnel. If it were easy, everyone would be doing well. It is possible, though.

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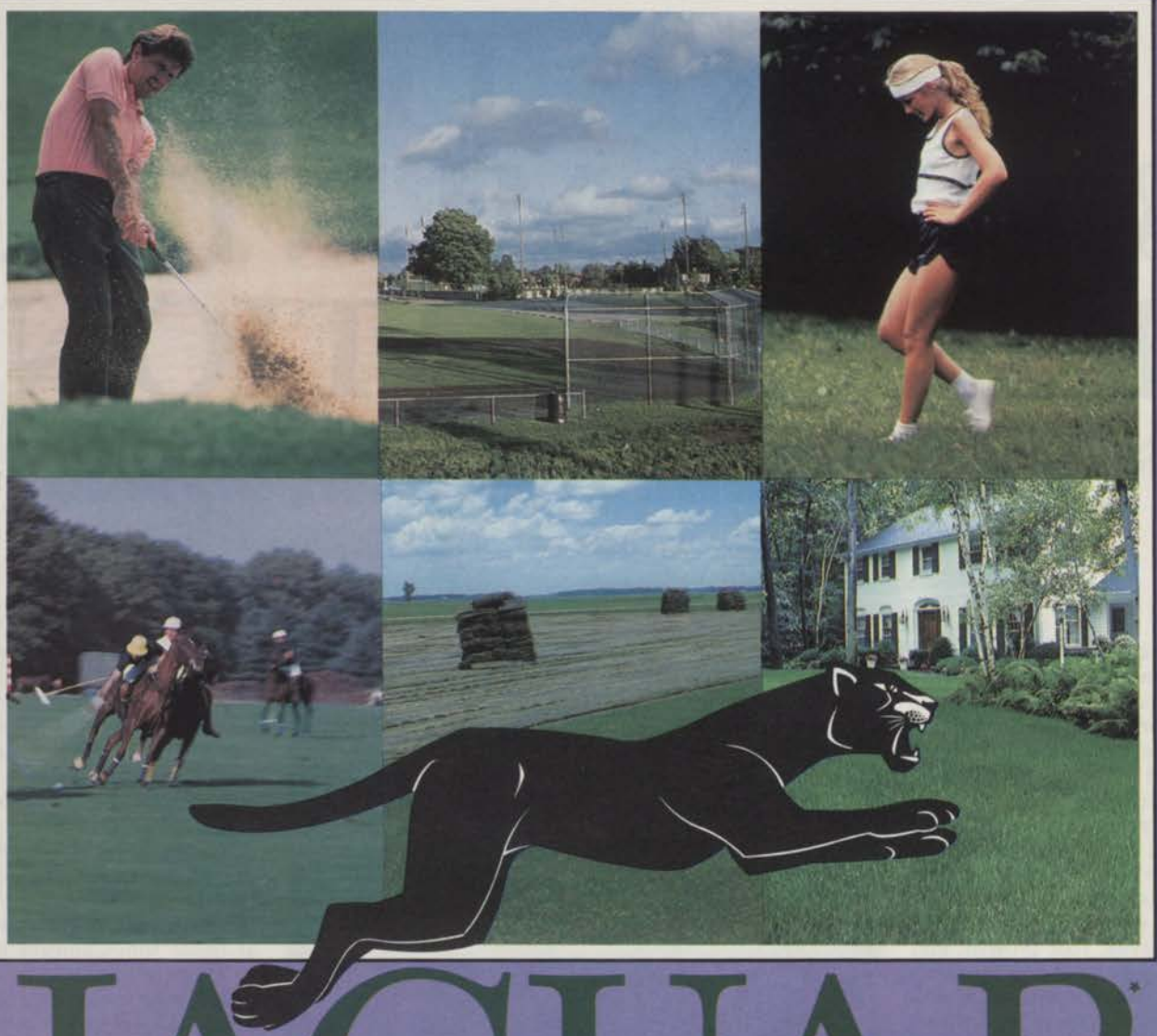

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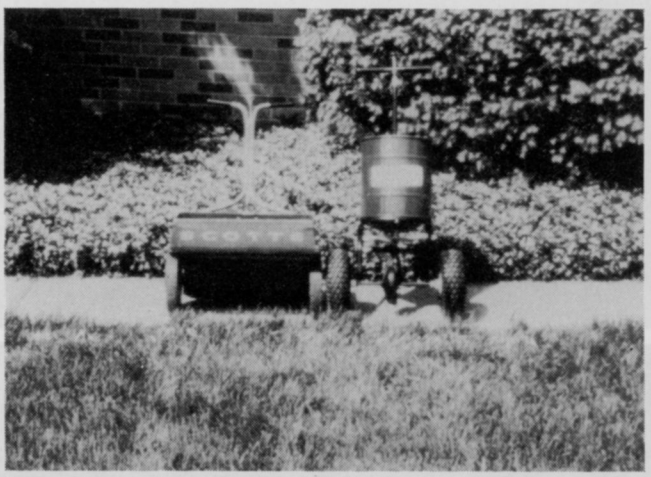
1985 GUIDE TO:

TURF, TREE & ORNAMENTAL FERTILIZATION

by Richard Rathjens and Roger Funk, Ph.D, Davey Tree Expert Co.

Traditionally, turfgrass managers apply fertilizer in spring and fall using color and the amount of leaf growth as guides to the rate and frequency of application.

Promoting good color and stimulating shoot growth are primary objectives, but nutrient influences on carbohydrate reserves, root growth, and the plant's ability to tolerate disease and environmental stress are often overlooked. Understanding these factors refines a fertilizer program.



Granular fertilizer and pesticide *formulations are normally applied to turfgrass with either a gravity (left) or centrifugal (right) spreader.*

Timing applications

An objective in timing fertilizer applications is to build carbohydrate reserves and promote root development. The response of warm-season and cool-season turfgrasses differs.

The predominant **cool-season** turfgrasses (bluegrass, perennial ryegrass, fescue and bentgrass) initiate and develop root systems in the early spring and fall. Fall application of nitrogen is needed because it increases carbohydrate reserves and root growth. It also improves turf density by promoting greater rhizome and tiller growth.

In addition to regular fall fertilization (September-early October), the relatively new concept known as **late fall** or late season fertilization is being included in many maintenance programs. Late fall fertilization is applied when shoot growth slows or approximately at the time of the last regular mowing of the season.

Nitrogen applied at this time greatly enhances the photosynthetic production of carbohydrates. These carbohydrates are stored for use the following growing season, providing earlier spring greenup and an energy source for turfgrasses to recuperate from environmental and mechanical stress.

Another advantage of late fall fertilization is that it reduces the need for high amounts of spring-applied nitrogen. Excessive **spring** fertilization can actually reduce carbohydrate reserves and root development by stimulating rapid shoot growth. This is because growing shoots take priority over roots for carbohydrate utilization.

Both spring and summer fertilization is used to maintain the color and density produced with fall and late fall fertilization the previous year. Fertilization at these times should not produce succulent plant tissue which can increase the severity of turfgrass disease and reduce the plant's ability to withstand heat, drought, mowing or wear stress.

Applications of **potassium** contribute to the hardiness of the plant and help "temper" the stimulating effects of nitrogen.

In contrast, most of the root growth in the **warm season grasses**—such as Bermuda, zoysia, and St. Augustine—occurs in spring and summer. Fertilization during these periods stimulates root growth. However, only moderate applications should be used in early spring in areas where warm-season grasses experience winter dormancy.

Bermudagrass and St. Augustinegrass experience **spring root dieback** following greenup. Heavy fertilization in early spring may result in additional stress during this critical period.

Like cool-season turfgrasses, warm-season grasses accumulate carbohydrate reserves in the fall when

Rathjens is senior agronomist and Funk vice president of technical and human resources for the Davey Tree Expert Co., Kent, OH

Doug, you say Super Greens Fertilizer works under conditions that can stop others cold. What do you mean? "Cold weather, of course. But also high pH *and* deficiencies in iron or manganese. All or any combination of those conditions."

Let's start with cold weather. What makes Super Greens better? "Super Greens works quickly in cold, wet soils—spring or fall—because most of its nitrogen doesn't depend on temperature-related microbial activity."

How quickly does it work? And what about staying power? "Your greens should respond within five days. And it's got enough kick left to last well into the second month."

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Let's talk about pH. You say Super Greens performs in high pH conditions. Why? "Because of the unique chemistry of the product and the homogeneity of the granules. If you have a high pH condition because of soil or irrigation water, Super Greens is for you."

What about the iron and manganese. What makes your micronutrients different? "Quantity and chemistry. Super Greens has enough iron and manganese to help overcome deficiencies, including those in sand greens. And both micronutrients are present in forms which make them available to the turf."

When and where does Super Greens work best? "In the Deep South, I'd recommend Super Greens on bermudagrass greens and tees all year long. In the Southeast, it helps keep bentgrass greens active from October through April, and it's great for ryegrass overseeded on bermuda greens and tees. It will also help bring bermudagrass out of dormancy quickly in the spring."

How about the rest of the country? "In cooler climates, superintendents can get earlier green-up in the spring and good strong color on their bentgrass greens through fall and right up to freezing weather."

How does Super Greens compare with competitive products? "In this business, you get cautious about saying that anything is 'the best'. But this fertilizer would have to rank among the very best I've ever seen."

For more information on new Super Greens Fertilizer, call your ProTurf® Tech Rep. Or call Scotts® direct at 800-543-0006.

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"It'll give you quick, healthy green-up under conditions that can stop other fertilizers cold."

Doug Horn, Scotts Research project leader (Fertilizer R&D), talks about new **Super Greens Fertilizer.**

Annual Nitrogen Requirement of Turfgrasses*

Species	Length of Growing Season	Nitrogen per Season lbs./ 1,000 sq. ft.	Variations in Management
Cool-Season:			
sheeps & hard fescue	4- 8	0- 3	low maintenance; roughs
red fescues	4- 8	1- 3	low maintenance to good care
Kentucky bluegrass	5-12	2- 8	lawns, fairways
bentgrasses	4- 8	1- 4	medium care, lawn, fairways
bentgrass, greens	5-12	6-15	clippings removed, forced growth
Warm-Season:			
zoysia	6-10	1- 6	adequate cover
common bermuda	7-12	2- 8	most variable
St. Augustine, Bahia	10-12	2- 8	warm areas, lawns
bermudagrass, fairways and tees	5-12	4- 9	good management
bermudagrass, greens	8-12	8-20	may rest over winter

* Adapted from Turf Managers' Handbook by William H. Daniel and Raymond P. Freeborg, published in 1973 by Harvest Publishing Company, New York, NY.

shoot growth activity slows. Care must be taken with the timing of fall fertilization since it may decrease low temperature hardiness if applied late. Maintaining adequate potassium levels in fall increase tolerance to low temperatures. As with cool-season turfgrasses, indiscriminate use of nitrogen fertilization in the summer can increase injury of warm-season grass subjected to disease or environmental stress. As mentioned previously, maintaining adequate soil potassium levels will aid warm-season turfgrass in their tolerance of heat, cold, mowing and wear stresses, and reduce their susceptibility to turfgrass diseases.

Rate of fertilization

The annual nitrogen requirement (pounds per 1,000 square feet) for turfgrass should be determined by considering several factors, including the length of growing season, degree of quality desired, purpose for which the turf is used, and the species and cultivars present.

The **length of growing season** (time between the last killing frost in the spring to the first in the fall) varies. Along the Gulf of Mexico and in certain areas of Arizona and California, it exceeds eight months. Portions of Maine and Minnesota, however, have as little as three and a half months. The longer the length of growing season, the greater the amount of nitrogen needed to maintain turfgrass quality.

Because of the **level of quality** desired is subject to human interpretation, the rate of fertilization can be tailored to meet the expectations of the user. A home lawn maintained for aesthetic purposes, for example, can range from a weed-free turf of acceptable color and density to a season-long turf of premium appearance.

An objective in timing fertilizer applications is to build carbohydrate reserves and promote root development.

The **purpose** for which the turf is used, whether it be for aesthetic or recreational function, will also influence the nitrogen fertility level. The rate of fertilization of bentgrass, for instance, can vary from four to 10 pounds of nitrogen per 1,000 square feet. Lower rates may be used to provide a pleasing appearance on a home lawn while higher rates may be applied to maximize the playability of a putting green.

Turfgrass species and cultivars can vary in amount of nitrogen required to maximize quality. Within the cool-season grasses, sheeps, hard and red fescues require a low level, Kentucky bluegrass a medium level, and bentgrass a high level of fertility. Improved cultivars of bermudagrass require more nitrogen than common bermuda.

Cultural practices such as irrigation and clipping removal may require the use of higher annual nitrogen rates to maintain the desired turfgrass quality. Supplemental watering of turfgrasses will increase the rate of which nitrogen is leached from the turfgrass root zone. Losses can be substantial when quick-release sources of nitrogen are applied to sandy soils.

Collection of clippings following mowing has been estimated to remove approximately 20 percent of the nitrogen applied to turfgrass. Additional nitrogen should be factored into the yearly total of these areas.

Phosphorus and potassium have been routinely applied along with nitrogen using fertilizer with ratios such as 3:1:2, 5:1:2 or 4:1:1. These ratios are based on the relative amounts of nitrogen, phosphorus and potassium found in turfgrass clippings but do not take into consideration the inherent levels found in the soil.

Their use should be based on a **soil test**. Many turfgrass soils contain high levels of phosphorus and little, if any, response is obtained by putting down more.

Two factors to be considered in making individual nitrogen applications are the source of nitrogen and the time of year.

Quick-release sources of nitrogen (for example ammonium nitrate, urea) are commonly limited to no more than one pound of nitrogen per 1,000 square feet. This rule of thumb is observed in spring and fall to avoid overstimulating shoot growth. Summer applications using quick-release sources are frequently limited to no more than one-half pound of nitrogen per 1,000 square feet. Low rates of quick-release sources also minimize the potential to cause fertilizer burn.

Applications of controlled-release nitrogen sources (such as U.F., IBDU, sulfur coated urea) are generally made at rates from one to three pounds of nitrogen per 1,000 square feet. The longer residual of these nitrogen sources reduces the need for more frequent applications, saving

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Liquid soil injection *can disperse either soluble or suspension fertilizers throughout the root zone of trees.*

turfgrass managers labor and time.

Method of application

Fertilizers can be applied in either dry or liquid forms, the subject of controversy in the lawn care industry. Research shows turf response is equal regardless of the method of application when considering a source of nitrogen such as urea. The application method then may be decided on the turf manager's perception of productivity.

Two types of spreaders are used to apply **granular (dry) fertilizers**: gravity and centrifugal. With the **gravity (drop) spreader**, fertilizer is held in a trough and agitated by a mixing bar connected to the wheels. The fertilizer is dropped through a series of slots to the turf below and spread in swaths.

The **centrifugal (broadcast)** type of spreader is commonly used by commercial turf managers because it applies a wider swath of material and can treat large areas more quickly. It features a hopper from which the fertilizer falls from a hole (or series of holes) onto a spinning disk which propels fertilizer ahead and to the sides of the spreader.

With a liquid application method fertilizer is either solubilized or suspended in water and sprayed on the turf.

The amount of water used normally varies from one to five gallons per 1,000 square feet. Equipment used can be broadly classified into either low pressure spray booms or high pressure or hydraulic sprayers. Both types feature a tank, pump to build pressure, pressure regulator, strainers or screens, and a nozzle.

Low-pressure spray booms, as the name implies, are operated at low pressures, generally in the range of 15-60 pounds per square inch (psi) and deliver one gallon or less of spray per 1,000 square feet.

They are designed to be driven over large areas delivering the spray from a series of nozzles in distinct swaths. They are often used by golf course superintendents on fairways.

High-pressure sprayers can create spray pressure of several hundred pounds or more and use a hose and hand-held nozzle for directed application and are used by lawn care companies.

FERTILIZATION OF TREES AND SHRUBS

Landscape trees and shrubs are often subject to adverse soil and environmental conditions. Compacted soils, poor drainage, restricted root areas as well as highway salts, air pollutants and competition from turfgrass contribute to plant stress and increase the importance of regular fertilization.

Vigorous trees are more resistant to insects and disease, more attractive and a greater asset to properties.

When trees are fertilized, only nitrogen, phosphorus and potassium are normally applied. However, supplemental micronutrients such as iron and manganese may be necessary for certain species growing in alkaline or sandy soils.

Plants often respond to applications of nitrogen with dramatic improvements in shoot growth and leaf color. Because of nitrogen's transitory nature in soils and the large amount extracted by plants, soil analysis is not particularly useful. Heavy applications of nitrogen alone may stimulate shoot growth more than root growth, disturbing the natural root/shoot ratio.

The need for supplemental phosphorus and potassium is more difficult to determine since phosphorus and potassium normally do not produce a noticeable, visible responseexcept on young or newly transplanted trees and shrubs. Also, results from field studies have been inconsistent because of differences in soil, age, condition and location of test species, and the timing and method of application. Where reliable soil tests are not available for phosphorus and potassium, most arborists fertilize all trees and shrubs with a complete fertilizer. Since arborists are concerned with the health of individual trees and

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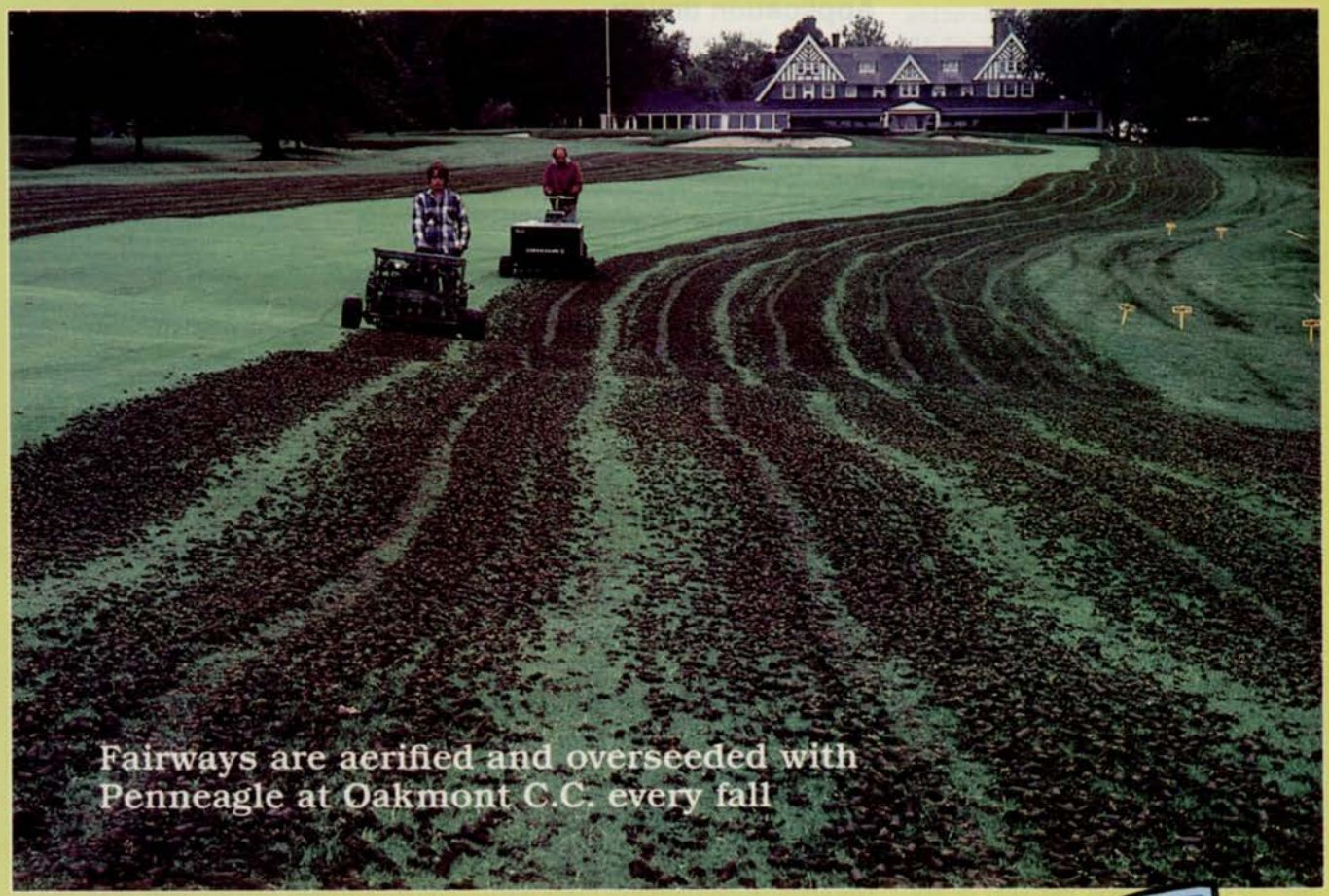

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shrubs growing in a wide variety of soil conditions, the most practical approach to fertilization is to provide an effective fertilizer formulation for trees and shrubs within a geographic area.

Specific soil/plant deficiencies may be addressed, if necessary, on an individual basis. In most cases a 3:1:1 (or similar) ratio is satisfactory for landscape plants although additional potassium and/or micronutriets may be advisable in sandy soils. Additional micronutrients may also be necessary in alkaline soils particularly for ericaceous or other so called "acid-loving" plants.

Iron deficiency chlorosis is common on oaks, rhododendron and pine grown on alkaline soils and has been reported on sweet gum, ginko and birch as well as many other woody ornamentals. **Manganese deficiency chlorosis,** also induced by alkaline soils, is a common problem with maples.

Application rates

Most fertilizer recommendations are based on the number of square feet in the **growing area** for shrub beds or the **branch spread** for individual trees and shrubs.

Fertilizer recommendations based on trunk diameter can result in over fertilization and damage to plants if the root system is restricted by paved areas, foundation walls, or other obstructions.

Three pounds of actual nitrogen per 1,000 square feet per year or six pounds every other year is satisfactory to maintain the health and vigor of deciduous trees and shrubs. If leaf color, annual growth or general vigor is unacceptable, six pounds of nitrogen per 1,000 square feet may be applied annually.

Broadleaf evergreens, small shrubs, flowering trees and recently transplanted or declining trees are more sensitive to fertilizer salts and should receive only about one-half the recommended rate, particularly when quick-release fertilizers are applied. The risk of injury to sensitive plants may be reduced by splitting the recommended annual amount into two or more applications.

The amount of fertilizer to be applied per 1,000 square feet of root areas can be calculated by dividing the percent nitrogen on the fertilizer bag into the desired nitrogen per 1,000 square feet.

For example, to determine the amount of 30-10-10 fertilizer required to apply six pounds of nitrogen per 1,000 square feet, divide .30 into 6, which equals 20 pounds (6/.30 equals 20).

Application timing

Although the roots of woody plants may elongate throughout the growing season, active root growth most often occurs in early spring and late fall when soil temperatures are cool and there is little competition from leaves for water and nutrients.

Fertilization is most effective when supplemental nutrients are available during these periods of optimum root growth. Soluble nitrogen fertilizers, because of their short residual in soils, should be applied between October and December and/or between February and April. Controlled-release nitrogen ensures availability in the root zone for a relatively long period, depending upon the solubility of the nitrogen source. The application timing of these fertilizers may not be a major concern.

The longer the length of growing season the greater the amount of nitrogen needed to maintain turfgrass quality.

Application techniques

Supplemental nutrients can be supplied to landscape plants through foliar sprays, trunk injections or applications on or beneath the soil surface. Though each method has advantages in specific situations, woody plants in most cases respond best to soil applications.

Surface applications

Nitrogen fertilizers can be applied to the soil surface since nitrates are highly mobile and will move downward into the root zone. When fertilizing woody plants in sodded areas, surface application should be limited to no more than three pounds of nitrogen per 1,000 square feet from a controlled-release source. However, since turfgrasses within the application zone may be injured or respond with undesirable succulent growth, trees and shrubs in quality lawns are often fertilized with subsurface applications.

Fertilizer containing phosphorus should not be applied to the soil surface. Phosphorus is bound to soil particles and does not move downward to contact the absorbing roots. Surface applications of phosphorus may also stimulate annual bluegrass which is undesirable in home lawns.

Drill hole technique

Fertilizer can be placed in the root zone by drilling holes in the ground and dividing the recommended amount of fertilizer equally among the holes. For trees, holes should be 12-18 inches deep and 18-24 inches apart, beginning two to three feet from the trunk and going two to three feet beyond the drip line.

To prevent turfgrass injury, fertilizer should be a least four inches below the soil surface. Calcined clay, perlite or other soil amendments can be used to fill the top of the hole or, in quality lawns, a plug of grass can be removed before drilling and replaced after adding fertilizer.

Soil injection

Liquid soil injection is a fast, economical alternative to the drill hole technique. The injection equipment consists of a hydraulic sprayer operated at 150-200 psi and an injector probe sticking about 12 inches into the soil. The injections are normally in a grid pattern about three feet apart within and slightly beyond the tree canopy.

Soil injection provides more thorough nutrient distribution than the vertical hole technique and generally can be done in about one-fourth the time.

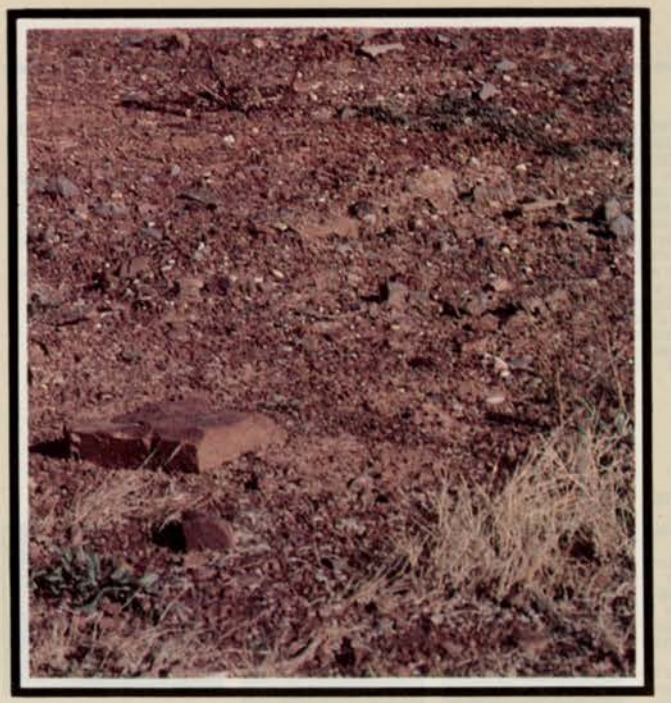
Unfortunately, most soluble fertilizers have a high burn potential and soluble nitrogen may leach from the root zone. It may remain in the root zone for as little as six weeks.

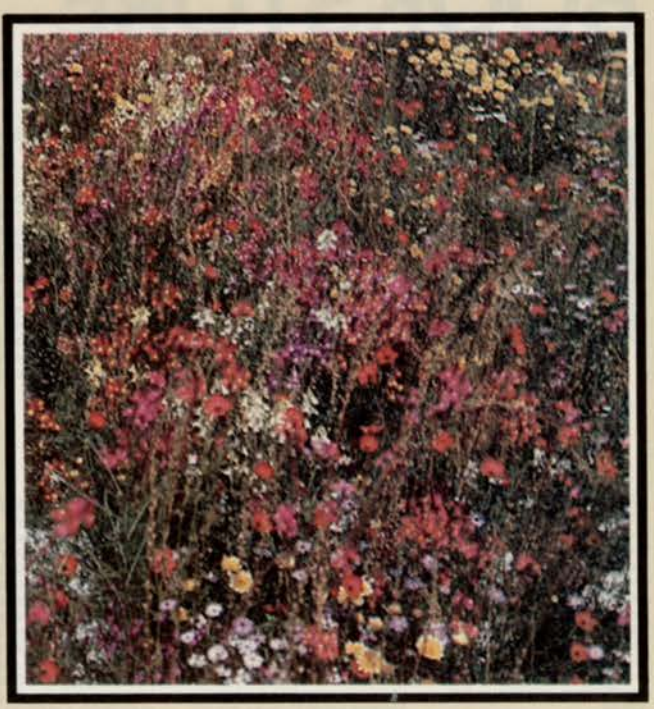
Because of the limitations of liquid soluble fertilizers, suspension fertilizers are gaining acceptance for soil injection. Ureaformaldehyde is particularly effective as a controlled-release nitrogen source in spraying systems since the release rate is not greatly affected by particle size. Suspended in water, powdered ureaformaldehyde can be injected into the soil and dispersed laterally by hydraulic pressure.

Soluble methylol and methylene ureas, recently introduced, have a lower burn potential than urea or other soluble nitrogen sources.

continued on page 50

Create a Colorful Difference





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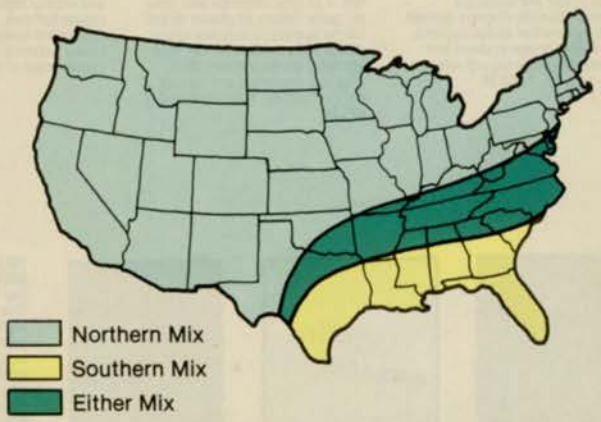

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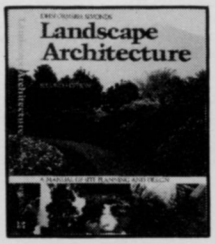

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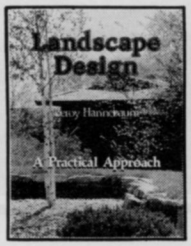

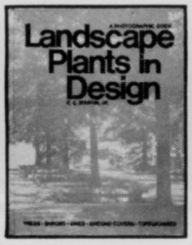

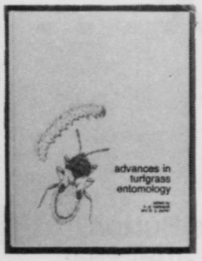

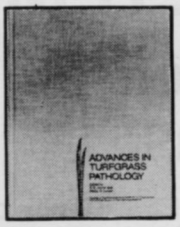

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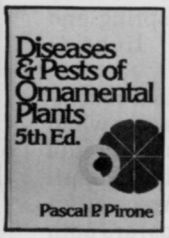

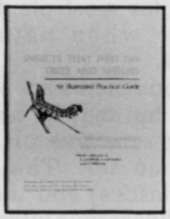

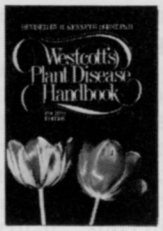

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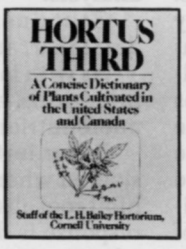
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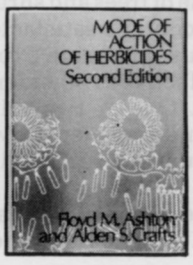

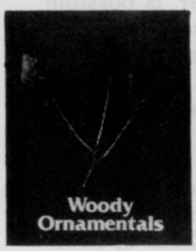

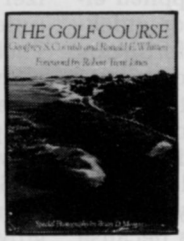

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WTT 85

GUIDE *from page 46*

Other methods

The **aero-fertil** technique injects dry fertilizer by blasts of air into drilled holes in the soil. This method is similar to drill hole application and provides additional aeration by fracturing heavy or compacted soils.

Fertilizer stakes or spikes are driven into the ground at intervals beneath the drip line of trees and shrubs. Although they contain satisfactory fertilizer materials, spikes are expensive and not as effective as other fertilization methods. One or two spikes per inch of trunk diameter provide only a small amount of fertilizer, little of which comes in contact with the root system since little lateral distribution occurs within the root zone of most soils.

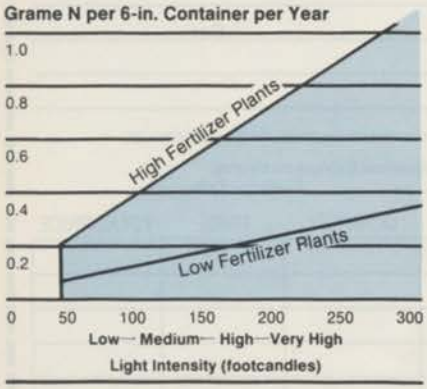
Foliage sprays and trunk injections and implants can supply a limited amount of nutrients to woody plants and are recommended for micro-nutrients whose availability is reduced by alkaline soils. These methods are most effective when a single micronutrient is deficient.

FERTILIZATION OF TREES AND SHRUBS IN CONTAINERS

The growing of trees and shrubs in landscape containers is common where plants are desirable but suitable planting sites limited.

They need careful attention because the reservoir of available growing media—minerals and water—is much smaller. Container soils, often wet and poorly aerated, are subject to excessive leaching and require a regular fertilization program.

Suggested Fertilizer Rates for Plants in Interior Landscapes



In general, recommended fertilizer rates for landscape plants based on square footage have been successful in maintaining container grown plants.

A complete fertilizer applied at an annual rate of 0.5 to one ounce of nitrogen per 10 square feet of container soil surface is commonly used. However, because of the wide selection in plant material, and variations in container design and growing media, fertilizer requirements are best determined through **soil and tissue analysis.**

Container fertilization includes dry, foliar, and liquid application.

As with landscape plants, foliar applications are usually limited to micronutrients.

Foliar fertilization should be considered where soil conditions may inhibit root absorption or where a quick response is desirable. Care should be taken to contain the spray since some micronutrient sources can stain.

Dry fertilizers may be applied either in controlled release or quick-release form. High analysis fertilizers may be difficult to evenly distribute because of the small amount required per container. Liquid applications of soluble or suspension fertilizers provide a uniform dosage and fast and easy distribution, but may require more frequent applications because they may leach from container soil.

FERTILIZING INTERIOR PLANTS

During production, the growth of foliage plants is accelerated by using considerable quantities of nutrients. These same plants grown indoors, however, usually receive less light, and neither require nor will tolerate the amount of fertilizer they received in production.

Precise fertilizer requirements are difficult to predict in interiorscape maintenance without measuring light at strategic locations.

Light varies from one side of a room to another, often within a few feet. Usually, the stronger the light under which foliage plants are growing, the greater the amount of nutrients needed. Recommended annual fertilizer rates can vary from as low as 0.3 grams of nitrogen per square foot for low light intensities to 3.0 grams for high intensities.

A complete fertilizer with a nitrogen/phosphorus/potassium ratio similar to those recommended for landscape plants is suitable for indoor plants. The highest levels of nutrients should be applied at optimum growth periods, for most plants, spring and summer when natural light is strongest.

Micronutrients are seldom recommended but may be necessary when growing sensitive plants in media other than soil. The rubber plant (Ficus elastica) and the Areca palm (Chrysalidacarpus lutescens) are both sensitive to boron deficiency.

In addition, the Areca palm can also become zinc deficient. Beware of overapplications of micronutrients because of toxicity problems.

The proper amount of nutrients is also determined by plant species. Plants normally grown under low levels of fertility include many ferns and fleshy plants such as Peperomia. Plants requiring high nutrient levels include rapid growing species and large leaved plants such as Ficus and Schefflera.

A build up of salts, both from fertilizer and irrigation water, is possible unless the root area is periodically flushed with excess water which is allowed to drain away. This is true when plants are over-fertilized during periods of low light and/or little growth.

Since visual symptoms such as stem rot and leaf necrosis in new growth are similar to those of overwatering, the soil should be tested for soluble salts. **WT&T**

Circle the number on the enclosed reader information card for more information on fertilizer products mentioned in this article.

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The Soluble Solution

Soluble fertilizers provide California golf course superintendent water and money-saving options for Palm Springs course.

Because of the large *number of blooming shrubs and ornamentals Caranci has selected a soluble 12-31-14 formulation as his all-purpose fertilizer. It can be fed to both turf and blooming flowers.*

Tom and Mike Caranci, *father and son superintendent team.*

In 1911, John Stroud, a Scottish greenkeeper visiting the California desert for the first time, observed that "while the land is cheap and plentiful in these parts, the climate will never support a fine 18-hole golf course the likes of which we have in Scotland."

With that, Stroud returned home convinced of the folly of the American land developers who had hired him to turn a 20,000-acre tract of wilderness there into a golfer's paradise.

Times change. And today, the California desert around Palm Springs supports some of the most beautiful, prestigious courses in the nation. Land is no longer cheap and plentiful. And the developers who seemed so crazy in 1911 now have grandchildren who laugh all the way to the bank.

Defying nature

But one part of Stroud's observation was true; the arid climate of the American Southwest does not lend itself well to the maintenance and upkeep of lush, healthy turf.

Today's golf course superintendents there face many of the same problems which Stroud had first envisioned: water is scarce, the dry season is long, and the land itself is less arable than a Scottish moor.

Tom Caranci, who has the development and maintenance of more than 35 courses throughout the region

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Across the nation, golf course superintendents like Dave are discovering that a little Nutriculture goes a long way toward keeping their turf at its peak, all year 'round.

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Plant Marvel

—Dave Tooley
Superintendent
Lakewood Golf Course
Lakewood, Colorado

At Canyon Country Club, *greens are fertilized once every seven to 10 days. To promote slow, steady growth, Caranci applies less than the recommended amount of soluble fertilizer, but applies it more often.*

to his credit, and is regarded by many of his peers as the dean of Southwestern golf course superintendents, also cites three major factors, unforeseen by Stroud, that are beginning to alleviate some of the problems.

They are the widespread use of irrigation; the development of new turfgrasses able to survive in the arid climate; and, from his own experience, the use of soluble fertilizers in place of the dry granular form still favored throughout most of the nation.

Caranci puts the greatest emphasis soluble fertilizers.

"Water is scarce here," he says. "I soon found that the dry granulars I was using required too heavy of a watering cycle. To release the nutrients to the turf, and to keep our close-cut greens from burning, I was applying three times as much water as I would have in another climate.

"As a result, I often got puddles of standing water on the greens, when, at the same time, I had burned-out brown patches on the fairways not 15 feet away."

In an area where golfers pay for and expect finely manicured greens and fairways, it was becoming quite a problem. Years earlier, in 1968, Caranci had experimented with soluble fertilizers while serving as superintendent at a private 18-hole course in Hawaii.

There, the rich volcanic soil produced lush, fast-growing turf—too lush and fast-growing to allow for even putting on the course's greens.

Caranci heard about a soluble fertilizer that promised controlled turf growth, and gave it a try.

He was skeptical at first, "but soon, you could see that it was working. The roots were better developed and stronger; the foliage stood up to heavy traffic with less strain."

Compatible

Other benefits also became clear. The soluble fertilizer was compatible with the pesticides and herbicides Caranci applied. It could be mixed in the same tank, and applied at the same time, eliminating the need for the two-step application process he was accustomed to, and saving him a considerable amount of time and labor. Plus, he could apply the soluble fertilizer in different concentrations as the turf required.

Because it was absorbed quickly by both foliage and roots, it was less likely to be washed away or leached beyond the root zone during Hawaii's rainy season.

"I was very satisfied with its performance," Caranci remembers. "So when I experienced problems with dry granulars at Cathedral Canyon, I wondered if solubles might not work in a arid climate as well."

As Caranci's greens and fairways now attest, they do.

But Caranci is quick to point out that solubles are not the miracle cure for turf as some superintendents believe. He cautions each superintendent to have a soil analysis done, and take into consideration the type of grasses grown, the length of the playing season, and the region's climate itself before making a switch from dry granulars to soluble fertilizers.

The arid climate of the American Southwest does not lend itself well to the maintenance and upkeep of lush, healthy turf.

"There are a lot of first-rate dry granulars out there," Caranci notes. "And they have their place. Even soluble fertilizer manufacturers will tell you that. But the more we superintendents learn about proper turf fertilization, and the sooner we realize that our time is worth a lot of money, I think we'll see a slow transition to the soluble fertilizers."

The transition at Cathedral Canyon was, however, anything but slow. After ascertaining that the manufacturer— Plant Marvel Laboratories of Chicago Heights, IL—did indeed make a soluble formula with the proper balance of nutrients and chelated trace elements for the summer bermudagrass and winter ryegrass grown on his course, Caranci immediately began regular application.

Soon, it was the only fertilizer he applied.

"I found that it required two-thirds less watering than dry granulars," says Caranci. "That's a big savings out here. And it helps save a lot of time and labor, because I just mix whatever concentration I want in our Injectomatic and pump it directly into the irrigation canals that feed the course. We've eliminated the standing water on greens, and the entire course is healthier, so it holds up better to the year-round heavy traffic."

Caranci applies the soluble fertilizer every seven to 10 days on his greens, and less frequently on his fairways. And because he believes that slow, steady growth is better in the long run, he generally applies less than the recommended amount.

"Maximum recommended application of most solubles is one pound per 1,000 square feet during the hottest, driest times of the year, and

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Solubles provide fertilizing option, increased control

In the past few years, sophisticated technology has been playing an increasingly important role in golf course maintenance.

Advanced fertigation techniques, chemicals and labor-saving equipment are giving the superintendent more control over his turf.

The move to soluble fertilizers parallels this growing emphasis on control. Solubles are not brand new on the market. Soluble fertilizers have been an option to superintendents for the past 10 years as an increasing number have experimented with them to supplement regular fertilization programs. This has especially been prevalent at times when traditional fertilizers have been less effective; namely, during the dry season, or when a quick green-up is required.

Compared to dry or liquid fertilizer formulations, soluble fertilizers tend to fall in a class of their own—a refinement of both dry and liquid, combining the advantages of both. For superintendents concerned with cost-effectiveness and control of nutrition, soluble fertilizers can be a viable alternative.

Soluble fertilizers come as a dry, very fine and easily diluted powder that ships and stores in bags and on pallets, just like dry fertilizers.

There is no need for large storage tanks, pumps or liquid transport equipment as with liquid fertilizer. All fertilizers use water to carry nutrients, since turf grasses can only absorb nutrients in liquid form. With granular formulations, nutrients are not readily available for absorption until water is added, either manually or as rainfall.

The amount of water necessary to release the nutrients depends on the type of fertilizer being used and the amount of moisture present in the soil. With so many factors involved, a precise degree of control can be difficult to achieve.

Too much water, and nutrients are leached from the root zone. Too little water, and the turf starves or dry season burning is the result. Often an excess of time and water is expended.

Soluble and liquid fertilizers are both diluted with water prior to application to facilitate turf absorption. Nutrients are fed to the grass in a form that allows immediate uptake by the plant. In carrying these nutrients to turf roots, soluble fertilizers make efficient use of water and provide total control over the water/nutrient ratio so that the plant can receive the exact diet it needs.

This ratio also adapts easily to compensate for moisture in the soil make-up.

Liquid and soluble fertilizers are applied the same way. Frequently-used boom sprayers provide a method comparable in cost to applying dry fertilizer.

The labor and cost payoffs are even better when the course has some type of irrigation system. Simply inject the fertilizer into the water system, and fertilizer can be applied anywhere that water can be pumped. More and more superintendents are finding this method, often called fertigation, to have advantages. To aid in tracking the injected fertilizer flow, some manufacturers have incorporated tracer dyes into their soluble formulations.

Completely harmless to turf, the dyes allow the superintendent to tell at a glance which sprinklers are putting out fertilizer.

Generally, soluble formulations are more expensive than dry or liquid fertilizers because of the high nutrient content and the degree of refinement. Some superintendents contend the increased efficiency tightens the price gap. □

slightly more during other seasons.

Most soluble fertilizer manufacturers agree that although even the maximum recommended application will not burn turf, it is better to apply smaller amounts on a regular basis. This practice tends to produce healthier turf that grows evenly and at a controlled rate.

This year, Caranci predicts that he will apply varying amounts of five different formulations.

The use of more than one formulation during the course of a year is a practice which Caranci strongly endorses, believing that the nutrition delivered to turf should change with its seasonal needs, and as it enters new stages of root and foliage development.

For his all-purpose fertilizer, which, due to its high phosphorus level, he also feeds to blooming shrubs and ornamentals around the course, Caranci has selected a 12-31-14 formulation, the same one he first tried in Hawaii.

On his summer bermudagrass, he will supplement this with regular feedings of a 25-5-20 Bermuda Special formulation; for his winter ryegrass, he applies 28-8-18, preceded by a heavy fall application of 13-0-44 high potash special, to prepare grass for winter stress and raise its level of disease resistance.

And, when soil analyses indicate that soil pH levels have risen too high, Caranci applies 25-5-20, a formula developed to supply bermudagrasses with the essential nutrients and trace elements they need, without the extra phosphorus they don't.

But, for superintendents who wish to emulate his success and rush out to buy the exact same formulations, Caranci offers a mild word of caution:

"I'm not here to tell other superintendents how to run their courses. I use only one manufacturer's products because I've found them to work best on my turf, and because they come in the specific formulations my turf needs, including trace elements. But no one NPK ratio will be right everywhere; even here, I sometimes mix formulations."

These words of caution are also echoed by Tom's son, Mike Caranci, who is golf course superintendent at two 18-hole, 7,000-yard courses also in the Palm Springs area.

"Soluble fertilizers help to balance out growth so you can control it better," he says. "It makes my greens more even and keeps leaf blades thin. This makes the greens easier to mow with a finer cut. The end results are healthier, faster greens. Soluble fertilizers save time and money because they're easier to apply. But, yes, you have to be certain it's right for your course before you start using it.

"As far as I'm concerned, solubles, applied properly, make a lot of sense on today's golf courses." But, he says, each superintendent will have to make that evaluation for themselves.

"This means as a group, we have to become better educated about fertilization. We have to begin to look at time spent on the course as an investment, and then decide which activities secure the best return on investment, and which ones don't. When we start to look at turf maintenance from a more scientific point of view, I think a lot of superintendents will realize the benefits offered by solubles." **WT&T**

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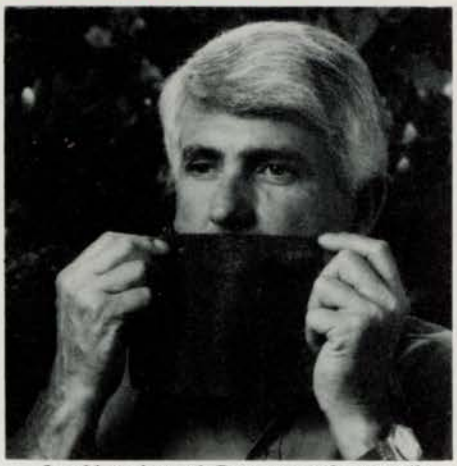

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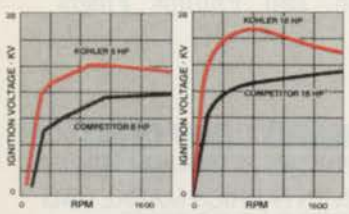

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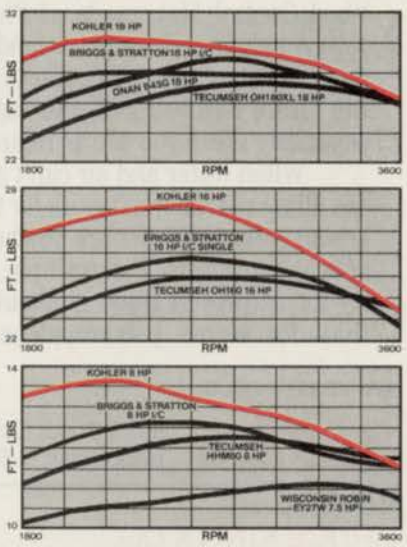

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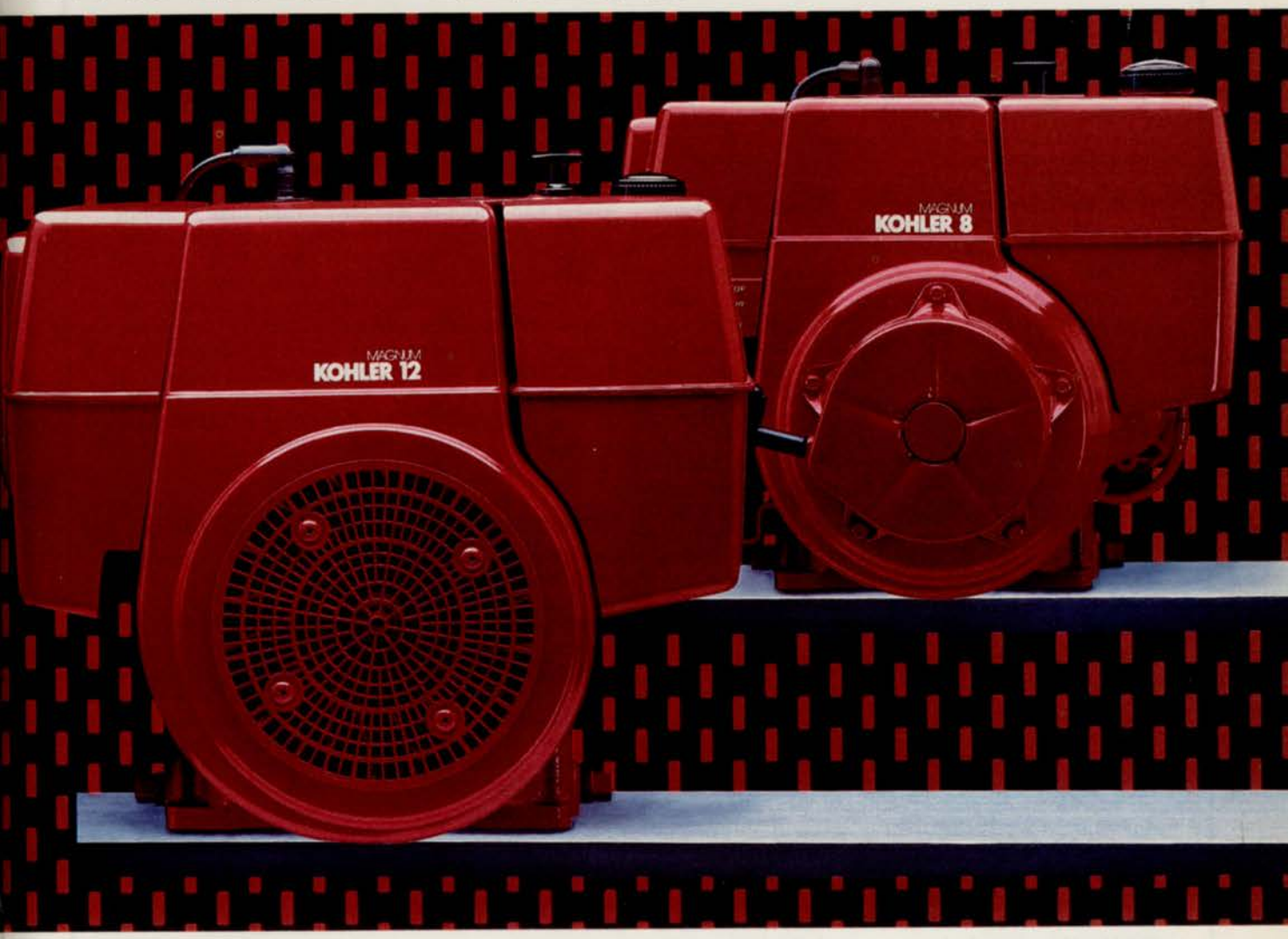

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KOHLER engines

Circle No. 145 on Reader Inquiry Card

PROBLEM SOLVERS

by **Balakrishna Rao**, Ph.D

Base watering on soil moisture

Problem: *Should a lawn sprinkler system be timed for 15 minutes each day or 1/2-hour every other day or night? (Massachusetts)*

Solution: Deep and infrequent watering is recommended for most home lawns to encourage deep rooting of turfgrass plants.

Deep rooting aids turfgrass establishment and drought tolerance. Ideally, watering should be based on soil moisture. As a "rule of thumb" watering once a week is sufficient; however, depending on the soil type and the time of the year, this frequency can change.

In answer to your specific question, it is better to water 1/2-hour every other day than to water 15 minutes every day. Shorter intervals tend to promote shallow rooting which may promote turfgrass susceptibility to drought. The best time to water would be about sunrise so that water on the leaf surfaces will dry before nighttime and discourage disease development.

Scale control for pin oaks

Problem: *How do I control the spread of scale on pin oaks? Dormant oil does not work. (Missouri)*

Solution: Usually dormant oil alone will not give 100 percent control of scale insects. The general principle in scale insect control requires the application of dormant oil when the plant is dormant plus one or more applications of insecticides for controlling crawler stages in summer.

Among many scale insects, obscure scale is one of the most common ones on oaks. Most likely this is the insect you are trying to control. For best results get the scale insect identified and then follow proper management practices.

Control of pine needle scale

Problem: *What can we use to control scales on pine needles? When is the best time? (New York)*

Solution: I believe you are referring to pine needle scale; however, it is important to properly identify the pest before applying pesticide to control it. Therefore, the following should help you identify the pine needle scale and its control. The pine needle scale attacks pine, spruce and occasionally hemlock, fir and taxus. Most severely affected are Austrian, Scotch, white, red and mugho pines and white and blue spruces.

This sedentary insect sucks large amounts of plant juices, turning the needles yellow and causing them to drop prematurely. If left uncontrolled, infestations can stunt and gradually kill branches and entire trees. Pine needles may appear nearly white when heavily infested with pine needle scale, an elongated insect one-tenth inch long, white with a yellow spot at one end.

During the fall, purple-red eggs are deposited beneath the white female covering; these eggs overwinter and hatch in late May (when lilac is in full bloom) and the reddish crawlers emerge from under the mother covering. Crawlers migrate to the new growth and, once established, do not move again.

In about seven weeks, this first brood matures and produces a second generation in late July. This brood matures in October and lays eggs which overwinter. Apply 60 or 70-sec. oil or oil plus ethion in April to kill eggs. This alone may not adequately control the problem. Therefore, apply malathion or dimethoate in late May to control crawler stage.

No leaching problem with Oftanol

Problem: *Is Oftanol subject to leaching when used on sandy soils? (Ohio)*

Solution: The manufacturer's (Mobay Chemical Company) representative indicated that, based on their research findings, Oftanol is not subject to leaching when used on sandy soils. Most of the Oftanol applied will remain in the thatch and soil interface. At 20°C the solubility of Oftanol in water is 20 ppm, which means it will dissolve in water but will not move rapidly.

In research on heavier soils (silty loam), the active ingredient and the next analogue was not found below two inches in a treated area. Although there is not enough information on Oftanol leaching in sandy soils based on the above research findings, Mobay does not expect the Oftanol to leach in soil.

Ground cover weed control

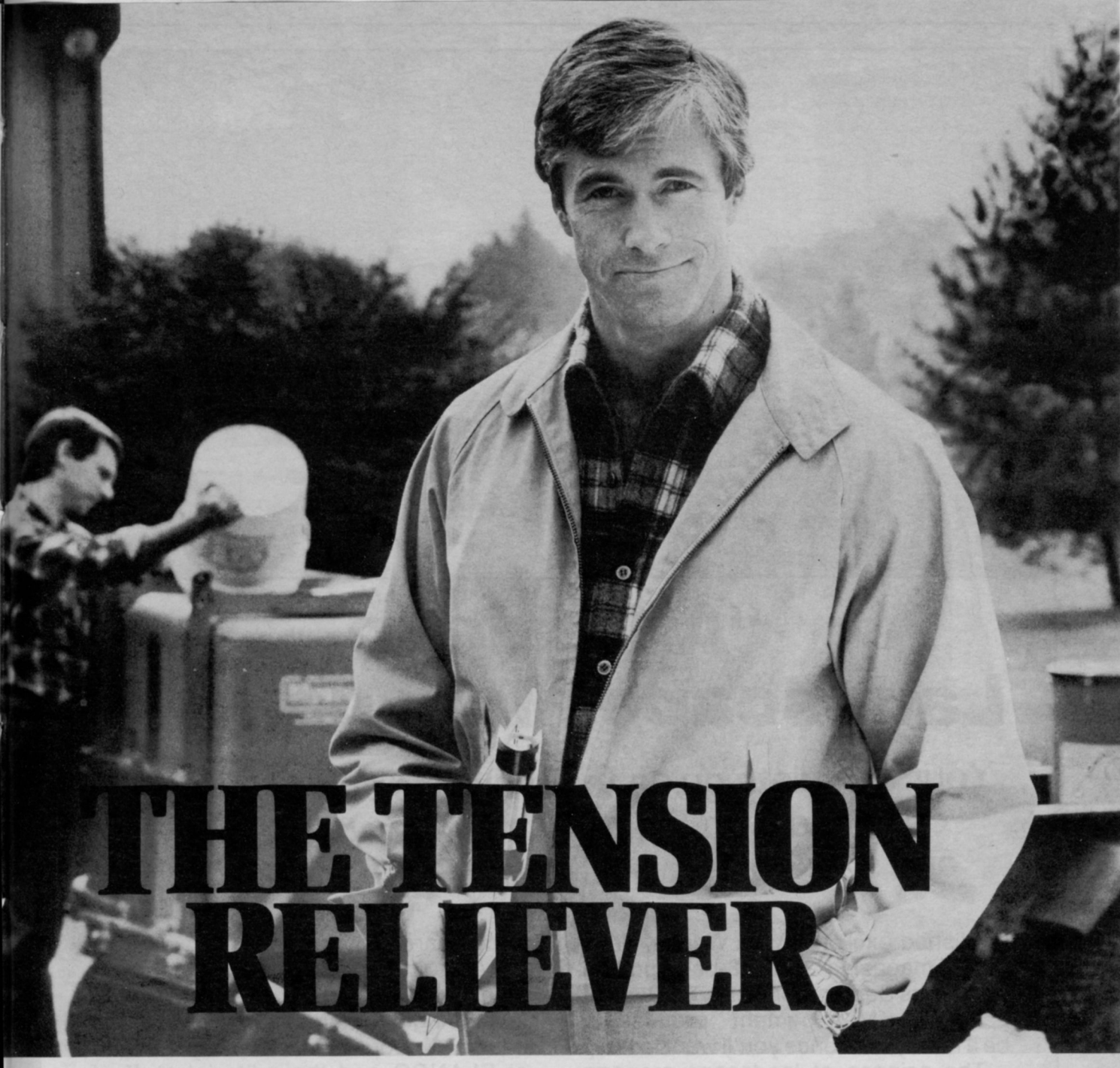
Problem: *Name some chemicals to safely kill crabgrass and weeds within ground covers such as junipers, ivy, etc. (Maryland)*

Solution: A number of preemergent herbicides such as Betasan, Dacthal, Enide, or ornamental weeder can be used safely to control crabgrass and other weeds in ground covers such as juniper, ivy, etc.

Since different herbicides may not be safe to use around the same ornamentals, read and follow directions on the label.

Balakrishna Rao is Director of Lawn Care Technical Resources for Davey Tree Expert Co., Kent, OH.

Questions should be mailed to Problem Solver, Weeds Trees & Turf, 7500 Old Oak Boulevard, Cleveland, Ohio 44130. Please allow 2-3 months for an answer to appear in the magazine.



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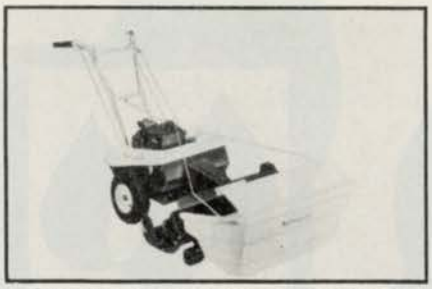
National unveils new reel; improves triplex

An out-front reel mower, the Model 30FTN, is National's latest turf maintenance offering. Individual wheel clutches located at the hand grips, adjustable handlebars, and hand-operated height adjustment are highlighted on this mower. Front caster wheels and pneumatic turf tires add to its maneuverability. It is powered by a 5-hp Briggs & Stratton engine.



Circle No. 190 on Reader Inquiry Card

National's "flagship" Model 84 Triplex reel mower sports recent improvements also. The 84 is available with a 12-hp Kohler electric-start engine or a 10-hp Briggs & Stratton. New and common to both is a foot-operated disc brake. New also on the Kohler-equipped model is a 3-gallon gas tank behind the engine for improved operating visibility. A dashboard shows a voltmeter, hourmeter, and remote choke lever. The engine is protected by a sturdy bumper.

With either engine-equipped Model 84, five or six-bladed reels are available, bushing or Timken rollers, and a high speed reel kit.

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Circle No. 106 on Reader Inquiry Card

Circle No. 191 on Reader Inquiry Card

New Delivery Vehicle by Cushman stronger

The new OMC-built 22 hp engine gives the 1985 Cushman Delivery Vehicle better performance and more punch for steep grades. The new engine replaces the previous 18 hp model.

The 3-wheel on-road Delivery Vehicle can haul 1,200 lbs., with more than 60 cu. ft. of covered cargo space and a top speed of 39 mph. It can be turned in an outside clearance circle of 17 feet.

Also available is a 4-wheel version, the 458 Delivery Vehicle for off-road use with a rated capacity of 1,400 lbs. and a top speed of 29 mph.

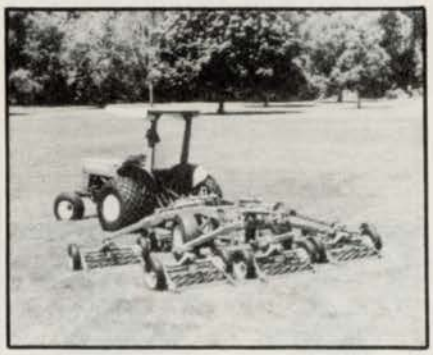
Both vehicles come with headlights, turn signals, stoplight/flashers, and hydraulic brakes on all wheels.

Circle No. 192 on Reader Inquiry Card

Jake hydraulic lift frame cuts mowing costs

Jacobsen introduces a new hydraulic ram lift frame for gang mowing. With gangs raised, the new 5/7's Ram Lift Ranger has a road width of just under 8 ft., allowing transport to remote mowing sites at speeds up to 20 mph behind any utility tractor.

The company points to golf courses, park and school districts, and contract mowing of large turf areas as applications where higher transport speed translates to more economical operation.



When all seven gang mowers are lowered, the 5/7's 15 ft. swath cuts more than 70 acres per shift. Six or five-gang configurations can be used in tighter mowing areas.

The 5/7's electric solenoid valve for lifting gangs permits use with any tractor. Lift controls are operated from the tractor seat.

Circle No. 193 on Reader Inquiry Card

Tye makes a planter for gardens, small areas

Tye introduces a a planter/seeder that can be pulled with most lawn and garden tractors, and three and four-wheel ATV's.

The unit, the Estate Planter, features seed metering for planting in rows 6, 8, or 10 inches apart. Seed is placed into the seed furrow behind a single 12-inch opening disc. Drag chains behind each opener cover and smooth the seeding.

The Estate Planter plants seeds

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ranging from grasses and legumes to certain garden vegetables. It is available in 3-point or pull-type hitch models with planting widths of 48 or 64 inches.

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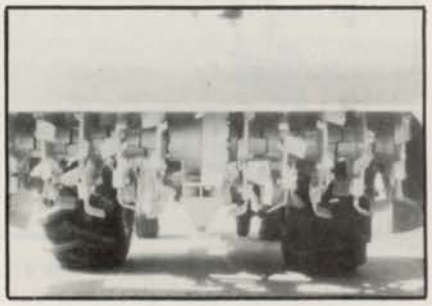
"World's largest" roto tiller debuts

The Seaman-Maxon Company introduces what it claims to be "the world's largest roto-tiller."

The mixing unit is mounted on a 143-hp International Harvester hydrostatic tractor. The tiller can mix up to 12 inches deep in ½-in. increments at a full width of 7 feet, the company says.



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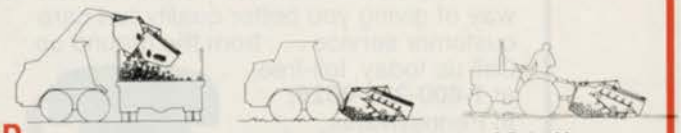

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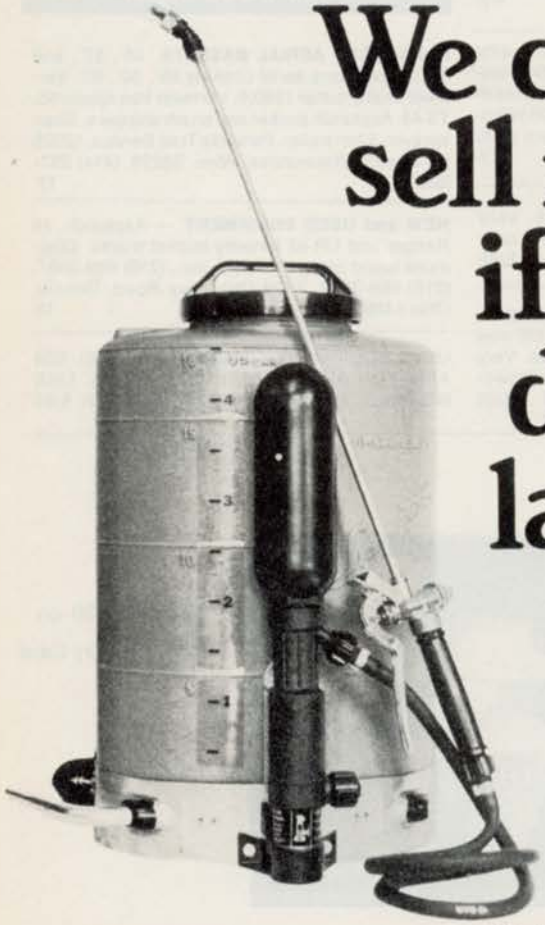

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Back Pack Sprayers are renowned for their long life. But that's just one of our features. Look at some others:

- **Quality** - precision components of the best materials.
- **Accessible** - pump assembly is external to minimize contact with corrosive liquid.
- **Simple** - no tools necessary to disassemble for cleaning or repair.
- **Comfortable** - lightweight construction designed for the comfort of the user.

Technical data	FLOX 2½ gal.	IRIS 3½ gal.	SENIOR 5 gal.
Weight #	11	11.4	12.1
Tank Capacity	2.6 gals.	3.9 gals.	5.2 gals.
Max. Working Pressure	84 PSI	84 PSI	84 PSI

Available in
5 Gal. (20 K)
3½ Gal. (15 K)
2½ Gal. (10 K)

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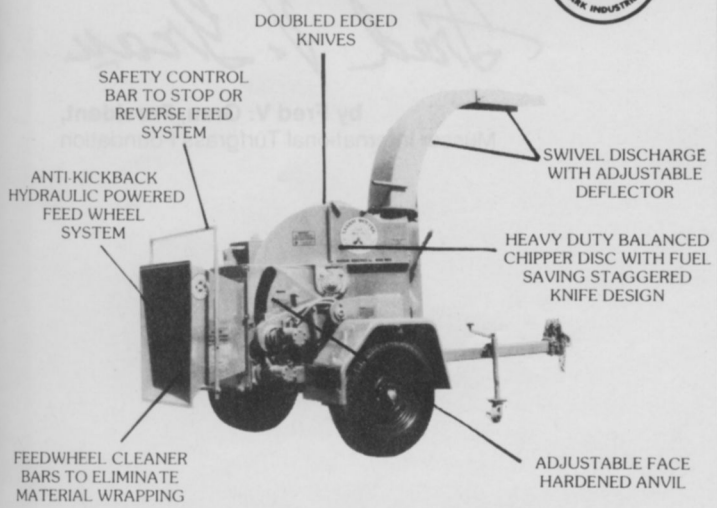
MORBARK "EEGER BEEVER"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HEAVY DUTY BALANCED CHIPPER DISC WITH FUEL SAVING STAGGERED KNIFE DESIGN
FEEDWHEEL CLEANER BARS TO ELIMINATE MATERIAL WRAPPING
ADJUSTABLE FACE HARDENED ANVIL

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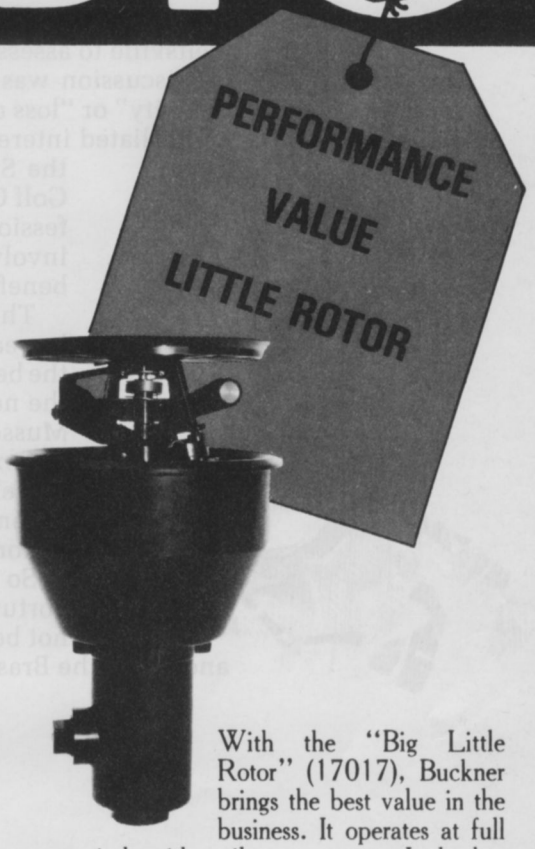
BIG



With the "Big Little Rotor" (17017), Buckner brings the best value in the business. It operates at full or part circle with easily set arc stops. It also has an anti-backsplash arm and a 23° trajectory angle to combat the wind. And these are just a few of the reasons it performs so well. An impact resistant plastic housing and lid and brass bearing journal make this little rotor tough enough to keep on performing for years.

Side and bottom inlets reduce installation costs. Maintenance is easy because all internal parts are removable from above ground *without any special tools*. And, a heavy retraction spring makes sure the sprinkler stays down when not in use.

For more information on the "Big Little Rotor" and other fine Buckner residential/light industrial products, contact your local Buckner distributor today!

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The Not-So-Elusive Brass Ring

On April 23, 1985, 14 leaders in various facets of turfgrass came together at Beltsville to assess the future of safer sports turf.

Discussion was open, frank and spirited with no hidden fears of "loss of identity" or "loss of territory."

Affiliated interests, such as the Professional Grounds Management Society, the Sports Turf Manager's Association, The Lawn Institute, the Golf Course Superintendents Association of America and the Professional Lawn Care Association of America, have become deeply involved in the sports turf movement because they see a long-range benefit to their memberships.

The executive directors of two of these groups greatly desire increased memberships so that more professional people can share the benefits of the information on sports turf now being gathered by the new Sports Turf Research and Information Committee of the Musser International Turfgrass Foundation, a neutral, unbiased, tax-exempt organization.

Helping affiliated groups become stronger is an unselfish act. "In union there is strength" as history has told us. Those who forget history are doomed to repeat it.

So now, through the existing turfgrass media, we have the opportunity to promote a "Green Machine," the strength of which has not been heretofore realized. Let us all forget petty protectionism and go for the Brass Ring. Let's all work together ... for safer sports turf.

Fred V. Grau

by Fred V. Grau, President,
Musser International Turfgrass Foundation

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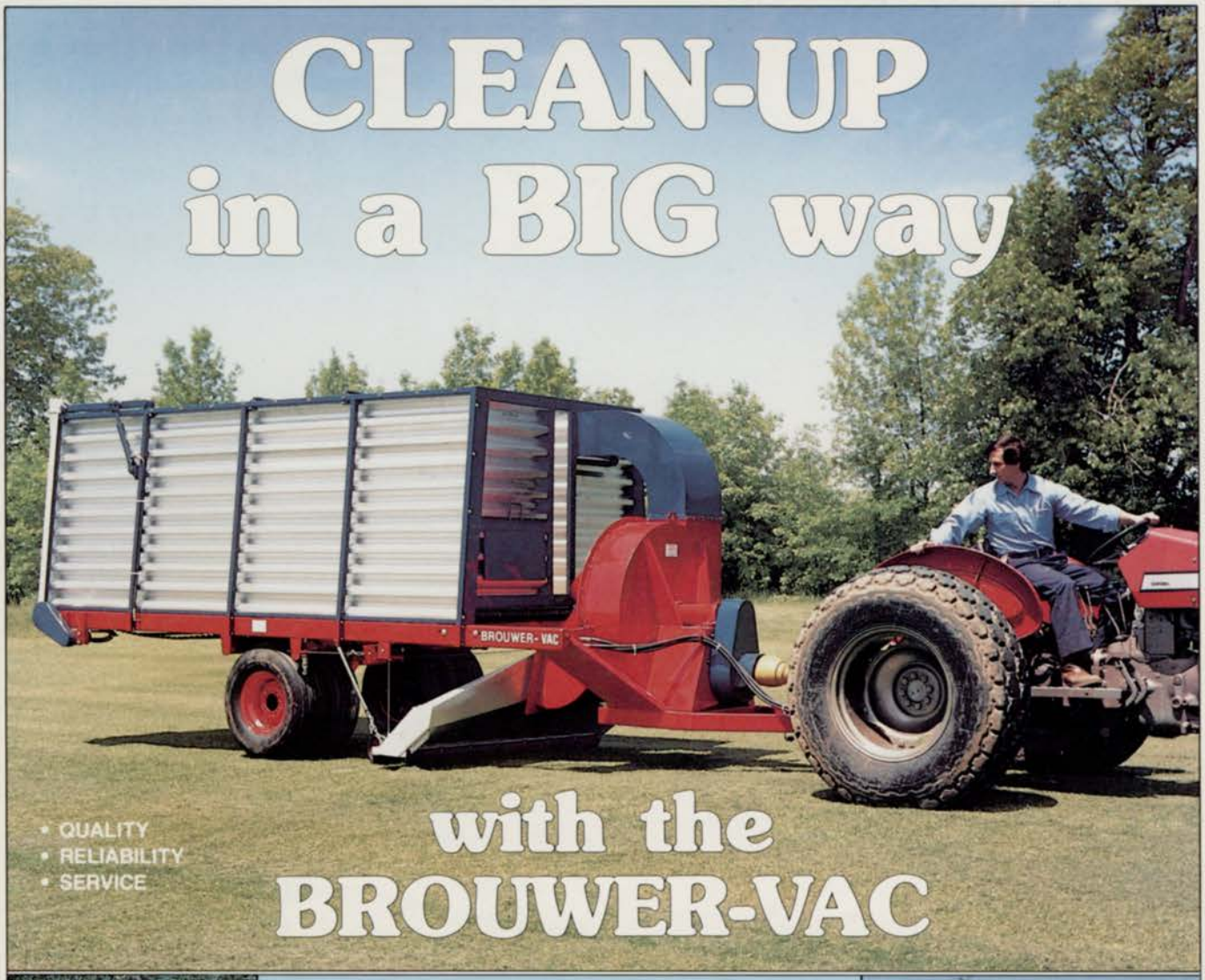
CLEAN-UP in a BIG way



- QUALITY
- RELIABILITY
- SERVICE

with the BROUWER-VAC

Also picks up debris & litter

OUTSTANDING FEATURES

- 335 cu. ft. load capacity
- Dual flotation wheels – low compaction
- All hydraulic operation – finger tip controls
- Extensive use of aluminum
- Wide, floating suction head - up to 120 in.
- 35 - 45 H.P. tractor requirement

Self unloading
with Hydraulic Door

The new Brouwer-Vac can be the answer to your clean-up problems. Designed to easily and economically pick up thatch from verti-cutting, grass clippings on sod farms, parks and golf courses. It has also proven very efficient when used to pick up leaves, twigs, paper, food containers and other such trash and litter that require cleaning up from airports, sports stadiums and highway shoulders. For these and other applications, the Brouwer-Vac will provide a fast, efficient, reliable and economical way for you to "clean-up BIG".

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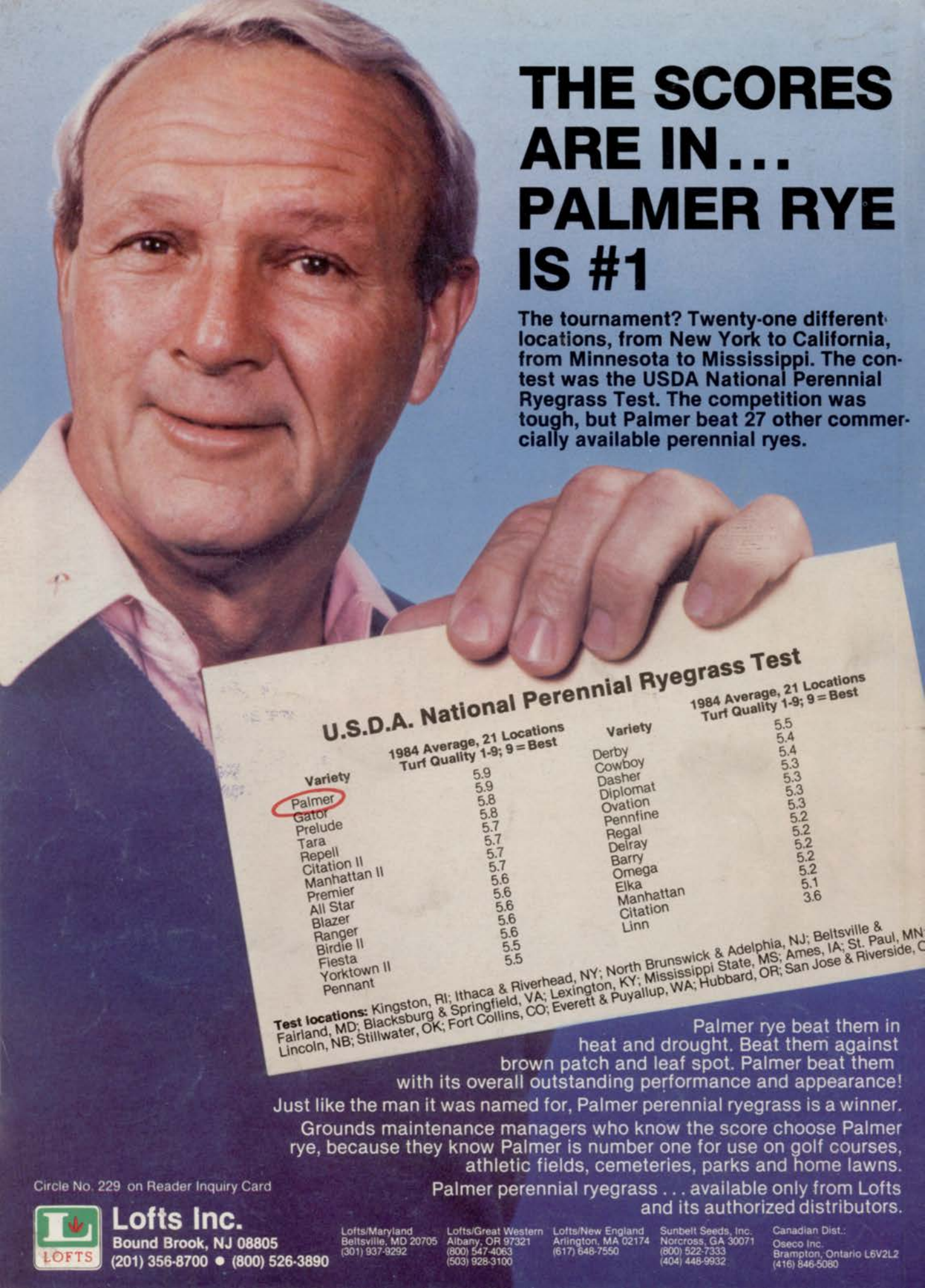

THE SCORES ARE IN... PALMER RYE IS #1

The tournament? Twenty-one different locations, from New York to California, from Minnesota to Mississippi. The contest was the USDA National Perennial Ryegrass Test. The competition was tough, but Palmer beat 27 other commercially available perennial ryes.

U.S.D.A. National Perennial Ryegrass Test

Variety	1984 Average, 21 Locations Turf Quality 1-9; 9 = Best	Variety	1984 Average, 21 Locations Turf Quality 1-9; 9 = Best
Palmer	5.9	Derby	5.5
Gator	5.9	Cowboy	5.4
Prelude	5.8	Dasher	5.4
Tara	5.8	Diplomat	5.3
Repell	5.7	Ovation	5.3
Citation II	5.7	Pennfine	5.3
Manhattan II	5.7	Regal	5.3
Premier	5.7	Delray	5.2
All Star	5.6	Barry	5.2
Blazer	5.6	Omega	5.2
Ranger	5.6	Elka	5.2
Birdie II	5.6	Manhattan	5.2
Fiesta	5.5	Citation	5.1
Yorktown II	5.5	Linn	3.6
Pennant			

Test locations: Kingston, RI; Ithaca & Riverhead, NY; North Brunswick & Adelphia, NJ; Beltsville & Fairland, MD; Blacksburg & Springfield, VA; Lexington, KY; Mississippi State, MS; Ames, IA; St. Paul, MN; Lincoln, NB; Stillwater, OK; Fort Collins, CO; Everett & Puyallup, WA; Hubbard, OR; San Jose & Riverside, C

Palmer rye beat them in heat and drought. Beat them against brown patch and leaf spot. Palmer beat them with its overall outstanding performance and appearance!

Just like the man it was named for, Palmer perennial ryegrass is a winner.

Grounds maintenance managers who know the score choose Palmer rye, because they know Palmer is number one for use on golf courses, athletic fields, cemeteries, parks and home lawns.

Palmer perennial ryegrass . . . available only from Lofts and its authorized distributors.

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